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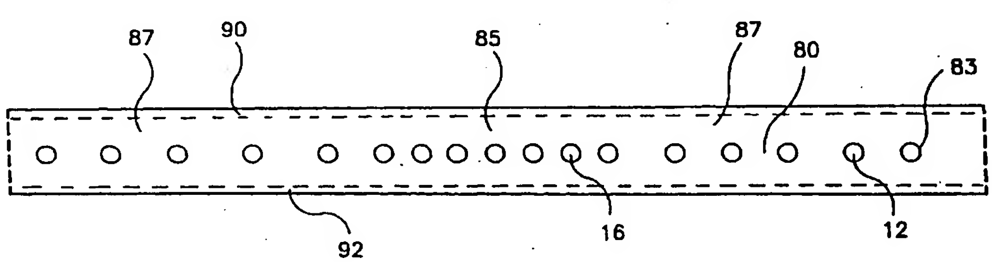
(54) Title: TARGETED ELASTIC LAMINATE



(57) Abstract: A targeted elastic laminate material having different zones of tension across a width of a material roll and methods for making the same. In one embodiment, the targeted elastic laminate material has at least one low tension zone with first filaments having a first basis weight and at least one high tension zone having second filaments with a second basis weight greater than the first basis weight. The second basis weight is greater due to increased average thickness of the second filaments and/or increased frequency of second filaments relative to the first filaments. In another embodiment, at least two polymers or polymer blends having different set properties are used to produce varying tension zones across the material. In yet another embodiment, the targeted elastic laminate material includes an elastic film with elastic strands placed thereon. The targeted elastic laminate material has elastic properties that provide improved fit characteristics to disposable personal care products.

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TARGETED ELASTIC LAMINATE

FIELD OF THE INVENTION

This invention relates to elastic laminate materials having different zones of elastic tension across a width of the material and processes for making the same.

BACKGROUND OF THE INVENTION

Conventional elastic laminate materials exhibit substantially homogeneous tension and set properties across the width of the material. These materials are often composed of either a continuous meltblown elastomer web or a series of identical continuous elastomer filaments bonded with a meltblown elastomer web. One process for producing a continuous filament stretch-bonded laminate is described in U.S. Patent 5,385,775, issued to Wright, the disclosure of which is incorporated by reference. Additionally, reinforcing filaments have been produced independently of the elastomer spinning process to implement bands having greater tension. However, this procedure is expensive and often results in an uncomfortable material.

Further, when conventional elastic laminate materials are wound onto rolls, the finished roll has varying diameters across the width of the roll resulting from varying tension and/or stretch across the width of the material. These varying diameters cause unwinding difficulties in the converting process due to the tendency of the material to steer across guide rolls and to not lay flat on the cutting rolls.

For these and other reasons, there is a need for a targeted elastic laminate material having different zones of tension across the width of the material, not requiring separate steps to form the high and low tension zones, for improved performance and appearance at a lower cost. Further, there is a need for an easier and less expensive process for making the targeted elastic material, compared to conventional processes for making conventional elastic laminate materials, whereby the laminate material can be wound onto a roll having a uniform diameter across the width of the roll for easy processing.

SUMMARY OF THE INVENTION

The present invention is directed to a targeted elastic laminate (TEL) material having at least one low tension zone and at least one high tension zone. The targeted elastic

material can have a series of continuous elastomeric filaments bonded to two facing materials. In one embodiment, the at least one high tension zone can have a higher basis weight, and the at least one low tension zone can have a lower basis weight, both formed from the same polymer material in the same extrusion step. In another embodiment, the at least one low tension zone can have a plurality of first filaments made from a first elastic polymer or polymer blend, and the at least one high tension zone can have a plurality of second filaments made from a second elastic polymer or polymer blend, both formed in the same extrusion step and stretched and bonded to two facing materials. The high tension zone of the material can have filaments made of a polymer or polymer blend with a higher elastic tension than the filaments in the low tension zone. A polymer blend in the high tension zone may include some of the same base polymer as a polymer blend in the low tension zone, but with a different percentage of a second component. Alternatively, polymer blends of the high and low tension zones may include different elastic base polymers.

The targeted elastic material of the invention can be used for garments having one or more garment openings for the wearer's waist, legs, arms, and the like. The high and low tension zones can be strategically aligned with the garment opening or openings. The TEL may have a substantially homogeneous appearance, and does not have a separately manufactured elastic band attached to it. Yet the TEL may have different elastic properties at different regions, and exhibits greater elastic tension and/or greater elongation in a region aligned with, and in the vicinity of, at least one garment opening. The elastic laminate provides better adhesion to its surrounding fabric, a more cloth-like look, eliminates elastic strand slippage caused by usage of thicker elastic fibers; provides processing advantages such as eliminating custom extrusion dies, and provides better post processing appearance, such as when cutting to form smaller strips of elastic material; and will give stretch and better stress relaxation performance as a result of the lamination. Furthermore, a garment can be produced according to the present invention without the use of a separately manufactured, separately attached elastic band, and is easier and less expensive to manufacture than a conventional garment having one or more elastic bands at the opening.

The high tension zone and low tension zone can have widths from under 0.5 inch to 50 inches or greater, depending on the processing equipment and the anticipated

application. For instance, in a disposable absorbent article, such as training pants, one or more zones of high tension having a width of about 0.5-3 inches, can be produced adjacent to a low tension zone covering the remaining width of the material sheet. The high tension zone may have a tension 1 to 8 times, alternatively about 2 to 4 times, greater than the tension of the low tension zone, at 50% elongation of the fabric.

In one embodiment of this invention, the TEL is made by a vertical filament stretch-bonded laminate (VF SBL) method. In another preferred embodiment, the TEL is made by a continuous filament stretch-bonded laminate (CF SBL) method, which is a modification of the process described in U.S. Patent 5,385,775 to Wright. In either case, a first nonwoven web made from a single polymer or polymer blend contains a first zone of first filaments adjacent a second zone of second filaments, the first and second zones having different average basis weights. The plurality of first filaments are extruded, cooled and stretched to form at least one low tension zone and the plurality of second filaments are extruded, cooled and stretched to form at least one high tension zone. The first and second filaments may be extruded through a single die. To make a stretch-bonded TEL, the filaments are stretched (e.g., uniformly) to about 2 times to about 8 times of their initial length. While the first nonwoven web is in the stretched condition, it is laminated and bonded to at least one, and alternatively two, polymeric layers which have not been stretched. The laminate is allowed to retract, and has different tensions corresponding to the different zones.

In another embodiment of this invention, the VF SBL or CF SBL method is modified to have first and second spinning systems with first and second dies positioned laterally adjacent to each other, to produce a single web having low tension zone filaments and high tension zone filaments of the same elastomeric polymer or polymer blend. The filaments in the high tension zone have a higher basis weight accomplished through larger filaments or higher filament frequency than the filaments in the low tension zone. The second spinnerette used to form the high tension zone has larger extrusion holes, and/or higher hole frequency, than the first spinnerette used to make the low tension zone.

In still another embodiment of this invention, the second spinning system is replaced with a set of individually controlled die plates positioned lateral to and/or

downstream from the first die. The second spinning system allows placement of the second filaments in between and/or on top of the first filaments to increase the basis weight and tension in a desired fabric zone.

In yet another embodiment of the invention, the elastomeric material can be a combination, or composite, of elastomeric film and strands which has superior adherence to overlaying nonwoven fiber webs to which it is applied. Alternatively, the targeted elastic material may be the incorporation of the composite elastomeric into a web of fibrous material used to make precursor garments. As another alternative, the targeted elastic may be the incorporation of fibrous material with an integral composite elastomeric into a finished garment.

These and other features and advantages will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of an elastic nonwoven layer including a plurality of first filaments forming at least one low tension zone and a plurality of second filaments forming at least one high tension zone extruded from a first die, according to one preferred embodiment of this invention;

Figs. 2 and 3 are sectional views of a TEL in which a barrier film is inserted in at least one of the high and low tension zones;

Fig. 4 is a sectional view of a TEL material in which the nonwoven web contains high and low tension zones accomplished using different filament densities;

Fig. 5 is a bottom plan view of a die plate from which the different basis weights causing the high and low tension zones are accomplished via different filament densities;

Fig. 6 is a sectional view of a TEL material in which the nonwoven web contains high and low tension zones accomplished using different filament sizes;

Figs. 7 and 8 are bottom plan views of die plates from which the different basis weights causing the high and low tension zones are accomplished via different filament sizes;

Fig. 9 is a schematic view of an elastic nonwoven web including a plurality of first filaments extruded from a first die, forming at least one low tension zone, and a plurality of second filaments extruded from a second die, forming at least one high tension zone, according to one preferred embodiment of this invention;

Figs. 10 and 11 are sectional views of a TEL material in which a barrier film is inserted in at least one of the high and low tension zones;

Fig. 12 is a sectional view of a TEL material in which the high and low tension zones are accomplished using different polymers or polymer blends;

Fig. 13 is a bottom plan view of a die plate useful for making nonwoven webs having higher and lower tension zones;

Fig. 14 is a sectional view of a TEL material having high and low tension zones accomplished using different polymers provided from different die plates;

Figs. 15-19 illustrate representative examples of the elastic laminate materials of the present invention;

Fig. 20 is a schematic view of one continuous vertical filament process for producing a stretch-bonded TEL material, according to one embodiment of this invention;

Fig. 21 is a schematic view of another vertical filament process for producing a stretch-bonded TEL material, according to another embodiment of this invention;

Fig. 22 is a schematic view of another vertical filament process for producing a stretch-bonded TEL material, according to another embodiment of this invention;

Fig. 23 is a schematic view of another vertical filament process for producing a stretch-bonded TEL material, according to another embodiment of this invention;

Fig. 24 is a schematic view of one continuous vertical filament process for producing a stretch-bonded TEL material, according to one embodiment of this invention;

Fig. 25 is a schematic view of another vertical filament process for producing a stretch-bonded TEL material, according to another embodiment of this invention;

Fig. 26 illustrates a representative process for making the elastic laminate and targeted elastic materials useful for making garments in accordance with the invention;

Fig. 27 is a schematic view of another process for making the elastic laminate and targeted elastic materials useful for making garments in accordance with the invention;

Fig. 28 illustrates a side view of an extruder die in relation to a first roller, as may be used with the apparatus of Fig. 26;

Fig. 29 is a perspective view of a horizontal continuous filament process for producing a stretch-bonded TEL laminate material, according to one embodiment of this invention;

Fig. 30 is a perspective view of a hybrid horizontal continuous filament and vertical filament process for producing a stretch-bonded TEL material;

Fig. 31 shows one exemplary adhesive spray pattern in which the adhesive has been applied to the elastic filaments with attenuation in the cross direction;

Fig. 32 shows a second exemplary adhesive spray pattern;

Fig. 33 illustrates a third exemplary adhesive spray pattern;

Fig. 34 shows a fourth exemplary adhesive spray pattern in a swirled-type of configuration;

Fig. 35 shows a fifth exemplary adhesive spray pattern that is more randomized and which provides a large percentage of adhesive lines in a perpendicular orientation to the elastic filaments;

Fig. 36 illustrates a sixth exemplary adhesive spray pattern having attenuation of adhesive lines in the cross-machine direction;

Fig. 37 shows a seventh exemplary adhesive spray pattern that resembles a "chain-link fence";

Fig. 38 shows an exemplary bond angle in one exemplary adhesive spray pattern;

Fig. 39 illustrates the bonding pattern and method of calculating the number of bonds per unit length on elastic strands or filaments;

Fig. 40 illustrates a perspective view of a pant-like absorbent garment in accordance with the invention, having targeted elastic gasket regions aligned with, and in the vicinity of garment openings;

Fig. 41 is a plan view of the garment shown in Fig. 40, showing the side facing away from the wearer;

Fig. 42 is a plan view of the garment shown in Fig. 40, showing the side facing the wearer;

Fig. 43 illustrates stress relaxation behavior of TE and non-TE materials at body temperature;

Fig. 44 illustrates hysteresis behavior of TE and non-TE materials; and

Fig. 45 illustrates stretch-to-stop behavior of TE and non-TE materials.

DEFINITIONS

The term "targeted elastic laminate" or "TEL" refers to an elastic laminate having at least one elastic nonwoven filament web, in which different zones of different elastic tension exist across a width of the web when the laminate is stretched in a longitudinal direction perpendicular to the width. The different zones may, but do not necessarily, have different elongations at break, or recoveries. What is important is that the different zones exhibit different levels of retractive force when the laminate is uniformly stretched by a selected amount. The elastic nonwoven filament web is laminated to at least one other layer, whereby the laminate exhibits different levels of elastic tension in zones corresponding to the high and low tension zones in the nonwoven filament web.

The term "targeted elastic stretch-bonded laminate" or "TE SBL" refers to a TEL which is formed by stretching the elastic nonwoven filament web having the zones of different elastic tension, maintaining the stretched condition of the elastic nonwoven filament web when the other layer is bonded to it, and relaxing the TEL after bonding.

The term "vertical filament stretch-bonded laminate" or "VF SBL" refers to a stretch-bonded laminate made using a continuous vertical filament process, as described herein.

The term "continuous filament stretch-bonded laminate" or "CF SBL" refers to a stretch-bonded laminate made using a continuous horizontal filament process, as described herein.

The term "elastic tension" refers to the amount of force per unit width required to stretch an elastic material (or a selected zone thereof) to a given percent elongation.

The term "low tension zone" or "lower tension zone" refers to a zone or region in a stretch-bonded laminate material having one or more filaments with low elastic tension characteristics relative to the filament(s) of a high tension zone, when a stretching or biasing force is applied to the stretch-bonded laminate material. Thus, when a biasing force is applied to the material, the low tension zone will stretch more easily than the high tension zone. At 50% elongation of the fabric, the high tension zone may exhibit elastic tension at least 10% greater, suitably at least 50% greater, alternatively about 100-800% greater, or about 150-300% greater than the low tension zone.

The term "high tension zone" or "higher tension zone" refers to a zone or region in a stretch-bonded laminate material having one or more filaments with high elastic tension characteristics relative to the filament(s) of a low tension zone, when a stretching or biasing force is applied to the stretch-bonded laminate material. Thus, when a biasing force is applied to the material, the high tension zone will stretch less easily than the low tension zone. Thus, high tension zones have a higher tension than low tension zones. The terms "high tension zone" and "low tension zone" are relative, and the material may have multiple zones of different tensions.

The term "nonwoven fabric or web" means a web having a structure of individual fibers or filaments which are interlaid, but not in an identifiable manner as in a knitted fabric. The terms "fiber" and "filament" are used herein interchangeably. Nonwoven fabrics or webs have been formed from many processes such as, for example, meltblowing processes, spunbonding processes, air laying processes, and bonded carded web processes. The term also includes films that have been cut into narrow strips, perforated or otherwise treated to allow air to pass through. The basis weight of nonwoven fabrics is usually expressed in ounces of material per square yard (osy) or grams per square meter (gsm) and the fiber diameters are usually expressed in microns. (Note that to convert from osy to gsm, multiply osy by 33.91.)

The term "microfibers" means small diameter fibers having an average diameter not greater than about 75 microns, for example, having an average diameter of from about 1 micron to about 50 microns, or more particularly, having an average diameter of from about 1 micron to about 30 microns.

The term "spunbonded fibers" refers to small diameter fibers which are formed by extruding molten thermoplastic material as filaments from a plurality of fine capillaries of a spinnerette having a circular or other configuration, with the diameter of the extruded filaments then being rapidly reduced as by, for example, in U.S. Patent 4,340,563 to Appel et al., U.S. Patent 3,692,618 to Dorschner et al., U.S. Patent 3,802,817 to Matsuki et al., U.S. Patents 3,338,992 and 3,341,394 to Kinney, U.S. Patent 3,502,763 to Hartman, U.S. Patent 3,502,538 to Petersen, and U.S. Patent 3,542,615 to Dobo et al. Spunbond fibers are quenched and generally not tacky on the surface when they enter the draw unit, or when they are deposited onto a collecting surface. Spunbond fibers are generally continuous and may have average diameters larger than 7 microns, often between about 10 and 30 microns.

The term "meltblown fibers" means fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity heated gas (e.g., air) streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter. Thereafter, the meltblown fibers are carried by the high velocity gas stream and are deposited on a collecting surface to form a web of randomly dispersed meltblown fibers. Such a process is disclosed for example, in U.S. Patent 3,849,241 to Butin et al. Meltblown fibers are microfibers which may be continuous or discontinuous, are generally smaller than 10 microns in diameter, and are generally self bonding when deposited onto a collecting surface. Meltblown fibers used in the invention are preferably substantially continuous.

The term "polymer" generally includes but is not limited to, homopolymers, copolymers, including block, graft, random and alternating copolymers, terpolymers, etc. and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the material. These configurations include, but are not limited to isotactic, syndiotactic and atactic symmetries.

The term "substantially continuous filaments or fibers" refers to filaments or fibers prepared by extrusion from a spinnerette, including without limitation spunbonded and meltblown fibers, which are not cut from their original length prior to being formed into a nonwoven web or fabric. Substantially continuous filaments or fibers may have lengths

ranging from greater than about 15 cm to more than one meter; and up to the length of the nonwoven web or fabric being formed. The definition of "substantially continuous filaments or fibers" includes those which are not cut prior to being formed into a nonwoven web or fabric, but which are later cut when the nonwoven web or fabric is cut.

The term "fiber" or "fibrous" is meant to refer to a particulate material wherein the length to diameter ratio of such particulate material is greater than about 10. Conversely, a "nonfiber" or "nonfibrous" material is meant to refer to a particulate material wherein the length to diameter ratio of such particulate material is about 10 or less.

The terms "elastic" and "elastomeric" are used interchangeably to mean a material that is generally capable of recovering its shape after deformation when the deforming force is removed. Specifically, as used herein, elastic or elastomeric is meant to be that property of any material which upon application of a biasing force, permits that material to be stretchable to a stretched biased length which is at least about 50 percent greater than its relaxed unbiased length, and that will cause the material to recover at least 40 percent of its elongation upon release of the stretching elongating force. A hypothetical example which would satisfy this definition of an elastomeric material would be a one (1) inch sample of a material which is elongatable to at least 1.50 inches and which, upon being elongated to 1.50 inches and released, will recover to a length of not more than 1.30 inches. Many elastic materials may be stretched by much more than 50 percent of their relaxed length, and many of these will recover to substantially their original relaxed length upon release of the stretching, elongating force. This latter class of materials is generally beneficial for purposes of the present invention.

The term "recover" or "retract" relates to a contraction of a stretched material upon termination of a biasing force following stretching of the material by application of the biasing force.

The term "series" refers to a set including one or more elements.

The term "set" refers to the difference between an elastic material before and after a biasing force is applied. It is measured as a percentage of the original unstretched material length. For example, if a 1.0 inch sample of elastic material were stretched to 1.50

inches, and recovered to 1.20 inches after the biasing force was removed, it would have a "set" of 20%.

The term "inelastic" refers to materials that are not elastic.

The term "gasket" or "gasket region" refers to a region of a garment which exhibits a moderate level of elastic tension against a wearer's body during use, and which restricts the flow of liquid and other material through a garment opening between the inside and outside of the garment. The term "fluid sealing gasket" is synonymous with these terms.

The term "targeted elastic regions" refers to isolated, often relatively narrow regions or zones in a single composite material or layer, which have greater elastic tension and/or elongation than adjacent or surrounding regions.

The term "elongation" refers to the capability of an elastic material to be stretched a certain distance, such that greater elongation refers to an elastic material capable of being stretched a greater distance than an elastic material having lower elongation.

The term "stretch to stop" or "STS" indicates the percentage of elongation of an elastic material when placed under a tensile load of 2000 grams.

The term "garment" includes personal care garments, medical garments, and the like. The term "disposable garment" includes garments which are typically disposed of after 1-5 uses. The term "personal care garment" includes diapers, training pants, swim wear, absorbent underpants, adult incontinence products, feminine hygiene products, and the like. For the purposes of the invention, a baby wipe is considered a personal care garment. The term "medical garment" includes medical (i.e., protective and/or surgical) gowns, caps, gloves, drapes, face masks, and the like. The term "industrial workwear garment" includes laboratory coats, cover-alls, and the like.

"Inward" and "outward" refer to positions relative to the center of an article, and particularly transversely and/or longitudinally closer to or away from the longitudinal and transverse center of the article, and are analogous to proximal and distal.

The term "film" refers to an article of manufacture whose width exceeds its height and provides the requisite functional advantages and structure necessary to accomplish the claimed invention.

The term "strand" refers to an article of manufacture whose width is less than a film and is suitable for securement to a film according to the present invention.

The term "thermoplastic" is meant to describe a material that softens when exposed to heat and which substantially returns to its original condition when cooled to room temperature.

The term "thermoset" describes a material that is capable of becoming permanently cross-linked.

With respect to the term "cross-link," while linear molecules are important, they are not the only type of polymer molecules possible. Branched and cross-linked polymer molecules also play an important role in the structure and properties of polymers. When additional polymer chains emerge from the backbone of a linear polymer chain, it is said to be branched. Branching is introduced intentionally by adding monomers with the capability to act as a branch. The amount of branching introduced must be specified to characterize a polymer molecule completely. The branching points are referred to as junction points. When the concentration of the junction points is low, the molecules may be characterized by the number of chain ends. For example, two linear molecules have four chain ends. If one of this linear molecule is attached to the middle of the other linear molecule the resulting structure looks like a "T". The total number of chain ends of this "T" molecule is three. Addition of another "T" to the end of another "T" will result in four chain ends. This process can be continued until a critical concentration of the resulting junction points is reached. Further coupling of the chain-ends leads to a transition that transforms a solvent soluble, and a thermally processable branched polymer to an infusible and insoluble polymer mass. The number of junction points in such a mass becomes so high that the polymer molecule is theoretically considered to be one giant molecule that has a three-dimensional network structure. When this condition is achieved it is said to be cross-linked. Polymer molecules can be cross-linked in several ways, by changing the chemistry or by irradiating it with high energy beams such as UV, gamma ray, e-beam, etc. Some examples of chemical cross-linking are: 1) natural rubber, cis-1,4-polyisoprene, cross-linked with sulfur. This was discovered by Goodyear in 1839. This reaction is also known as vulcanization; 2) vinyl polymers cross-linked with divinyl monomers, for example

polystyrene polymerized in the presence of divinyl benzene, 3) condensation polymers prepared from monomer of functionality greater than two, for example polyester formed with some glycerol or tricarboxylic acid, and 4) polysilicones cross-linked by reaction of benzoyl peroxide. An example of cross-linking by high energy electron beam is the cross-linking of polyethylene by radiation.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

In accordance with the invention, a targeted elastic laminate material (TEL) is provided, having different zones of tension across its width. As shown in Fig 1, the TEL includes an elastic nonwoven layer 6 including at least one low tension zone 10 having a plurality of elastomeric first filaments 12 and at least one high tension zone 14 having a plurality of elastomeric second filaments 16. First filaments 12 and second filaments 16 can be made from the same elastomeric polymer or polymer blend (i.e., have substantially the same composition). Alternatively, first filaments 12 and second filaments 16 can be made from different polymers or polymer blends, (i.e., have different compositions). The TEL material may have multiple high and low tension zones, and each zone may have a different average elastic tension and a different ultimate elongation. Again, the tension of a material is the amount of force per unit width needed to stretch the material to a given elongation. The ultimate elongation is the ultimate length per unit length that a material can be stretched to without causing permanent deformation.

In one embodiment, at least one low tension zone 10 is laterally adjacent at least one high tension zone 14. As shown in Fig. 1, the plurality of first filaments 12 are extruded from first die 30 to form low tension zone 10. The plurality of second filaments 16 are extruded from first die 30 to form high tension zone 14 laterally adjacent low tension zone 10. In other embodiments, low tension zone 10 and high tension zone 14 are laterally spaced apart from each other. In another embodiment, at least a portion of high tension zone 14 overlaps a portion of low tension zone 10.

Figs. 2 and 3 show two embodiments of a TEL material in accordance with the invention. Several examples of processes that can be used to make the TEL material are illustrated in Figs. 20-23, 29, and 30. As shown in Figs. 2 and 3, TEL 5 may include a first

facing material 18 bonded to a first side of first filaments 12 forming a low tension zone 10 and second filaments 16 forming a high tension zone 14. TEL 5 may also include an opposing second facing material 20 bonded to a second side of first filaments 12 forming a low tension zone 10 and second filaments 16 forming a high tension zone 14. Each of first facing material 18 and second facing material 20 may comprise a nonwoven web, for example a spunbonded web or a meltblown web, a woven web, a film, or a meltblown continuous filament composite web. First facing material 18 and second facing material 20 may be formed using conventional processes, including the spunbond and meltblowing processes described in the above "DEFINITIONS." For example, the facing materials may include a spunbonded web having a basis weight of about 0.1-4.0 osy, suitably 0.2-2.0 osy, or about 0.4-0.6 osy. First facing material 18 and second facing material 20 may comprise the same or similar material or different material.

First facing material 18 and second facing material 20 can be bonded to first filaments 12 and second filaments 16 by an adhesive, for example an elastomeric adhesive such as Findley H2525A, H2525 or H2096. Other bonding means well known to those having ordinary skill in the art may also be used to bond first facing material 18 and second facing material 20 to filaments 12 and 16 including thermal bonding, ultrasonic bonding, mechanical stitching and the like.

In one embodiment of this invention, a barrier film 75, suitably a polymer film, more suitably a polyolefin film such as a polyethylene film, may be positioned between layers of first filaments 12 and/or second filaments 16 (Fig. 2), and/or between a layer of first filaments 12 and/or second filaments 16 and first facing material 18 and/or second facing material 20 (Fig. 3).

Figs. 4-8 illustrate various TEL laminates and die arrangements useful for preparing the elastomeric nonwoven web 6. In the laminate of Fig. 4, the nonwoven web 80 includes a plurality of equally sized elastic filaments arranged in a single row 83. In a higher tension region 85 of the web 80, the filaments 16 are substantially uniformly spaced and are relatively close to each other. In two lower tension regions 87 of the web 80, the filaments 12 are substantially uniformly spaced but are further apart from each other. The higher tension region 85 contains filaments 16 having relatively higher density (i.e., relatively

higher numbers of filaments per unit cross-sectional area), resulting in higher nonwoven web basis weight and higher elastic tension. The lower tension regions 87 contain filaments 16 having relatively lower density (i.e., relatively fewer filaments per unit cross-sectional area), resulting in lower nonwoven web basis weight and lower elastic tension. The nonwoven web 80 can be laminated between facing layers 90 and 92, which can be any of the materials described above. The filaments 12 and 16 may be extruded from different zones of a single die or die arrangement, or from two or more different dies.

Fig. 5 illustrates an embodiment of die 30 which operates to make a nonwoven web 80 as shown in Fig. 4. In Fig. 5, the die openings 31 are arranged in two rows 33 and 39 instead of one, and are staggered so that individual openings 31 in row 33 are not directly over openings 31 in row 39. When the resulting nonwoven web is contacted with rollers or a conveyor, the extruded filaments may tend to align in a parallel fashion. The die openings 31 have higher frequency in the central region 35 than in end regions 37, corresponding to the desired variations in filament density.

In the laminate of Fig. 6, the web 80 includes a plurality of filaments arranged in a single row 83. In this embodiment, the filaments 16 in the central (high tension) region 85 of the web have a larger size than the filaments 12 in the end (low tension) regions 87. The larger diameter filaments 16 have relatively larger size, resulting in higher nonwoven web basis weight and higher elastic tension. The smaller diameter filaments 12 have relatively smaller size, resulting in lower nonwoven web basis weight and lower elastic tension.

Fig. 7 illustrates an embodiment of die 30 which operates to make a nonwoven web 80 as shown in Fig. 6. In Fig. 7, the die openings 31a and 31b are arranged in two rows 33 and 39 instead of one, and are staggered so that the individual die openings 31a and 31b in row 33 are not directly over the openings 31a and 31b in the row 39. Again, when the resulting nonwoven web is contacted with rollers or a conveyor, the filaments may tend to align in a parallel fashion.

The die of Fig. 8 illustrates how numerous high and low tension zones can be formed in a single nonwoven web. A central region 35 of die 30 includes openings 31 of large diameter, and is used to produce a higher basis weight, higher tension zone.

Intermediate zones 41, located on both sides of central region 35, include openings 31 of small diameter with large spaces between them, and are used to produce lower basis weight, lower tension zones. First end zone 43, configured similarly to central region 35 with large diameter die openings, is used to produce a higher basis weight, higher tension zone in the resulting nonwoven web. Second end region 45, configured with lower diameter die openings spaced close together, is also used to produce a higher basis weight, higher tension zone. In summary, zones of higher basis weight and higher elastic tension can be produced in an elastomeric nonwoven web a) using filaments of any diameter but higher nonwoven web density (more filaments per unit cross-sectional area) than in adjacent lower tension zones, and/or b) using filaments of higher diameter than in adjacent zones.

First filaments 12 and second filaments 16 may have the same or different basis weights, the same or different average filament diameters, and the same or different filament densities (defined as the number of filaments per unit cross-sectional area). The basis weight of first and second filaments 12, 16 is expressed in grams per square meter (gsm) or ounces of material per square yard (osy). First and second filaments 12 and 16 can have a first basis weight of about 2 gsm to about 32 gsm, suitably about 4 gsm to about 30 gsm. An important feature of the invention is that the polymer or polymer blend used to make the second filaments 16 can have a different tension (i.e., can exhibit a different retractive force when stretched) than the polymer or polymer blend used to make the first filaments 12. Thus, TEL 5 can include a low tension zone 10 having a first tension and a high tension zone 14 having a second tension greater than the first tension. A standard tensile test can be performed on low tension zone 10 and high tension zone 14 wherein load applied to the material is measured as a function of elongation. At 50% elongation, high tension zone 14 suitably has a second tension at least 10% greater, or alternatively 50% greater, suitably about 100-800% greater, or as another alternative about 125-500% greater, or alternatively about 200-400% greater than a first tension of low tension zone 10. Thus, low tension zone 10, when stretched, exhibits less retractive force than high tension zone 14.

In the embodiment shown in Fig. 9, the plurality of first filaments 12 are extruded from first die sections 30 to form low tension zone 10. The plurality of second filaments 16 are extruded from a second die section 36 to form high tension zone 14 laterally

adjacent low tension zone 10. In other embodiments, low tension zone 10 and high tension zone 14 are spaced apart from each other. In another embodiment, some or all of high tension zone 14 overlaps a portion of low tension zone 10.

Figs. 10 and 11 show two embodiments of a TEL material in accordance with this aspect of the invention. Several examples of processes that can be used to make the TEL material are illustrated in Figs. 23-25, 29, and 30. As shown in Figs. 10 and 11, a first facing material 18 is bonded to a first side of first filaments 12 and second filaments 16. TEL 5 may also include an opposing second facing material 20 bonded to a second side of first filaments 12 and second filaments 16. Each of first facing material 18 and second facing material 20 may be any of the facing materials described with respect to the previous embodiments. Also, first facing material 18 and second facing material 20 can be bonded to first filaments 12 and second filaments 16 by any of the techniques described with respect to the previous embodiments.

In one embodiment of this invention, a barrier film 75, suitably a polymer film such as a polyethylene film, is positioned between layers of first filaments 12 and/or second filaments 16 (Fig. 10), and/or between a layer of first filaments 12 and/or second filaments 16 and first facing material 18 and/or second facing material 20 (Fig. 11).

Figs. 12-14 illustrate some TEL laminates and a die arrangement useful for preparing the elastomeric nonwoven web 6. In the laminate of Fig. 12, the nonwoven web 80 includes a plurality of lower tension elastic filaments 12 and higher tension elastic filaments 16, arranged in a single row 83. In a higher tension region 85 of the web 80, the higher tension elastic filaments (formed of an elastic polymer or polymer blend exhibiting higher elastic tension) are arranged next to each other and are substantially uniformly spaced. In two lower tension regions 87 of the web 80, pluralities of lower tension elastic filaments 12 (formed of an elastic polymer or polymer blend exhibiting lower elastic tension) are arranged next to each other, and are substantially uniformly spaced. The filaments 12 and 16 may be extruded from different zones of a single die or die arrangement, or from two or more different dies. The nonwoven web 80 can be laminated between facing layers 90 and 92, which can be any of the facing materials described above.

Fig. 13 illustrates an embodiment of a single die or die assembly 30 which can be used to make a nonwoven web 80 similar to that shown in Fig. 12. In Fig. 13, the die openings 31 are arranged in two rows 33 and 39 instead of one, and are staggered so that individual openings 31 in row 33 are not directly over openings 31 in row 39. When the resulting nonwoven web is contacted with rollers or a conveyor, the extruded filaments may tend to align in a parallel fashion. The die openings 31 in central region 35 extrude the second filaments 16 from the second polymer or polymer blend. The die openings 31 in the end regions 35 and 37 extrude the first filaments 12 from the first polymer or polymer blend.

In the laminate of Fig. 14, the nonwoven web 80 is produced using a two-die system, as described below, wherein a narrower band of higher tension elastic filaments 16 is extruded over a wider band or web of lower elastic tension filaments 12. As a result, the higher tension zone 85 in the nonwoven web includes both high tension filaments 16 and low tension filaments 12. The lower tension zones 87 includes only the lower tension filaments 12.

In the embodiment shown in Fig. 15, an elastomeric laminate 410 comprises an elastomeric film 412 having a first major surface 414 and a second major surface 416. Secured to the first major surface 414 are strands 418 of elastomeric material. The longitudinal axes of the film 412 and the strands, collectively 418, run in the same direction, which in Figs 15-19 is the indicated Z direction going into the illustration. The elastomeric strands 418 are suitably but not necessarily secured to the film 412 by a combination of tackifiers within the elastomeric compositions and an application of melt sprayed adhesive on the film's major surface. The right side 420 and left side 422 of the film 412 may have differential spacing among their respectively grouped strands which can impart a different level of tension between the two areas. It will be appreciated that the strands may be laid out periodically, non-periodically, and in various spacings, groupings, sizes, and compositions of elastic material according to the effect desired from the elastic laminate and the use to which it is put. For example, Fig. 16 illustrates unequal sized elastomeric strands 418 with the left side grouping being of larger diameter and thus of higher tension than the smaller diameter right side grouping. While referred to as being of different diameter, it will be appreciated that the elastomeric strands 418 need not be circular in cross-section within the

context of the present invention. Fig. 17 illustrates that the strands of different size may be intermingled within groupings in regular or irregular patterns. Fig. 18 illustrates that various strands 418 may be secured to both of the first and second major surfaces 414, 416 respectively, of the film 412. Fig. 19 illustrates that the laminate of the film 412 and strands 418 may have an additional film 424 secured to the strands 418 thereby sandwiching the strands 418 between the first, or original, film 412 and the second film 424. All of the above techniques as well as the basis weight and physical structure, e.g. strand-like, film-like or meltblown structures may be utilized, in conjunction with the chemical compositions of the laminate elements to vary the elastic tension of the laminate as a whole. Also, the tension of different portions of the film 412 can be varied from one another, and in addition, the tension among the strands 418 can vary from one another as well. Furthermore, rather than a film 412, a sheet of netting or nonwoven may instead be used as the substrate for attaching the strands 418.

Materials suitable for use in preparing elastomeric first filaments 12 and second filaments 16, as well as elastomeric films and strands, herein include diblock, triblock, tetrablock, or other multi-block elastomeric copolymers such as olefinic copolymers, including styrene-isoprene-styrene, styrene-butadiene-styrene, styrene-ethylene/butylene-styrene,styrene-ethylene/propylene-styrene-ethylene/propylenetetrablock, or styrene-ethylene/propylene-styrene, which may be obtained from the Shell Chemical Company, under the trade designation KRATON® elastomeric resin; polyurethanes, including those available from B. F. Goodrich Co., under the trade name ESTANE® thermoplastic polyurethanes; polyamides, including polyether block amides available from Ato Chemical Company, under the trade name PEBAX® polyether block amide; polyesters, such as those available from E. I. Du Pont de Nemours Co., under the trade name HYTREL® polyester; and single-site or metallocene-catalyzed polyolefins having density less than about 0.89 grams/cc, available from Dow Chemical Co. under the trade name AFFINITY®. The different polymers or polymer blends used to prepare first filaments 12 and second filaments 16 can have the same or different elastomeric properties.

A number of block copolymers can be used to prepare thermoplastic elastomeric filaments 12, 16, elastomeric strands 418, and films 412 useful in this invention.

Such block copolymers generally comprise an elastomeric midblock portion B and a thermoplastic endblock portion A. The block copolymers may also be thermoplastic in the sense that they can be melted, formed, and resolidified several times with little or no change in physical properties (assuming a minimum of oxidative degradation).

Endblock portion A may comprise a poly(vinylarene), such as polystyrene. Midblock portion B may comprise a substantially amorphous polyolefin such as polyisoprene, ethylene/propylene polymers, ethylene/butylene polymers, polybutadiene, and the like, or mixtures thereof.

Suitable block copolymers useful in this invention include at least two substantially polystyrene endblock portions and at least one substantially ethylene/butylene mid-block portion. A commercially available example of such a linear block copolymer is available from the Shell Chemical Company under the trade designation KRATON® G1657 elastomeric resin. Other suitable elastomers include KRATON® G2760 and KRATON® G2740, both of which are also available from Shell Chemical Company.

Other suitable elastomeric polymers may also be used to make thermoplastic elastomeric filaments 12, 16. These include, without limitation, elastomeric (single-site or metallocene catalyzed) polypropylene, polyethylene and other alpha-olefin homopolymers and copolymers, having density less than about 0.89 grams/cc; ethylene vinyl acetate copolymers; and substantially amorphous copolymers and terpolymers of ethylene-propylene, butene-propylene, and ethylene-propylene-butene.

Single-site catalyzed elastomeric polymers (for example, constrained geometry or metallocene-catalyzed elastomeric polymers) are available from Exxon Chemical Company of Baytown, Texas, and from Dow Chemical Company of Midland, Michigan. The single-site process for making polyolefins uses a single-site catalyst which is activated (i.e., ionized) by a co-catalyst.

Commercial production of single-site catalyzed polymers is somewhat limited but growing. Such polymers are available from Exxon Chemical Company under the trade name EXXPOL® for polypropylene based polymers and EXACT® for polyethylene based polymers. Dow Chemical Company has polymers commercially available under the name ENGAGE®. These materials are believed to be produced using non-stereo selective single-

site catalysts. Exxon generally refers to their single-site catalyst technology as metallocene catalysts, while Dow refers to theirs as "constrained geometry" catalysts under the name INSITE® to distinguish them from traditional Ziegler-Natta catalysts which have multiple reaction sites. Other manufacturers such as Fina Oil, BASF, Amoco, Hoechst and Mobil are active in this area and it is believed that the availability of polymers produced according to this technology will grow substantially in the next decade.

Alternatively, the elastomeric strands 418 and/or films 412 can be made of a polymer that is not thermally processable, such as LYCRA® spandex, available from E. I. Du Pont de Nemours Co., or cross-linked natural rubber in film or fiber form. Thermoset polymers and polymers such as spandex, unlike the thermoplastic polymers, once cross-linked cannot be thermally processed, but can be obtained on a spool or other form and can be stretched and applied to the film 412 or strands 418 in the same manner as thermoplastic polymers. As another alternative, the elastomeric strands 418 and/or films 412 can be made of a thermoset polymer, such as AFFINITY®, available from Dow Chemical Co., that can be processed like a thermoplastic, i.e. stretched and applied, and then treated with radiation, such as electron beam radiation, gamma radiation, or UV radiation to cross-link the polymer, or use polymers that have functionality built into them such that they can be moisture-cured to cross-link the polymer, thus resulting in a polymer with the enhanced mechanical properties of a thermoset.

First filaments 12 and second filaments 16 may also contain blends of elastic and inelastic polymers, or of two or more elastic polymers, provided that the blend exhibits elastic properties. First filaments 12 and second filaments 16, or strands, may be substantially continuous or of specific length, but are desirably substantially continuous. Substantially continuous filaments have better elastic recovery than shorter filaments. First and second filaments 12, 16 may be circular but may also have other cross-sectional geometries such as elliptical, rectangular, triangular or multi-lobal. First and second filaments 12, 16 or strands may have the same or different geometries, and the same or different sizes (e.g., diameters), and the same or different densities (expressed in number of filaments per unit cross-sectional area across the web). In one embodiment, one or more of

the filaments or strands may be in the form of elongated, rectangular film strips produced from a film extrusion die having a plurality of slotted openings.

As mentioned, in one embodiment first filaments 12 can have a first basis weight and second filaments 16 can have a second basis weight greater than the first basis weight. In this embodiment, the second basis weight is suitably at least 10% greater than the first basis weight, suitably at least 50% greater, or 100-800% greater, alternatively 125-500% greater, or as another alternative 200-400% greater. First filaments 12 can have a first basis weight of about 2 grams per square meter (gsm) to about 14 gsm, or about 4 gsm to about 12 gsm, and second filaments 16 can have a second basis weight of about 10 gsm to about 32 gsm, or about 12 gsm to about 30 gsm. Thus, TEL 5 has low tension zone 10 having a first tension and high tension zone 14 having a second tension greater than the first tension.

Elastic tension can be measured, for instance, using an MTS Sintec Model 1/s, available from MTS in Research Triangle Park, North Carolina, with a cross head speed set to 500 mm/min. Samples having a 3-inch width and 6-inch length can be used, with 3 inches of the length clamped inside the jaws (leaving 3 inches of length for testing). The tension of each high and low tension region can be measured after the portion of the TEL material being tested is held in the extended condition (in the machine direction of the TEL) for 60 seconds.

Referring again to Figs. 2 and 3, the second basis weight of second filaments 16 may be greater than the first basis weight of first filaments 12 as a result of an increase in a diameter of spinning holes 31 in the higher basis weight region, as explained above with respect to Figs. 6 and 7. The first average thickness (e.g., diameter) of first filaments 12 and the second average thickness (e.g., diameter) of second filaments 16 can be about 0.010 inch to about 0.040 inch, suitably about 0.020 inch to about 0.032 inch. Assuming filaments 12 and 16 have about the same density (expressed as number of filaments per unit cross-sectional area), second filaments 16 should have an average diameter at least 5% higher, suitably at least 20% higher, or 40-300% higher, alternatively 50-125% higher, or as another alternative 75-100% higher than the average diameter of first filaments 12.

Alternatively, as explained with respect to Figs. 4 and 5, the second basis weight of second filaments 16 can be greater than the first basis weight of first filaments 12

as a result of an increase in frequency of spinning holes 31 in a second spin plate region 37 relative to the frequency of spinning holes 31 in first spin plate region 35. First filaments 12 can have a first frequency and second filaments 16 can have a second frequency of about 4 holes per square inch ("hpi") to about 40 hpi, or about 12 hpi to about 30 hpi. Assuming filaments 12 and 16 have the same diameter, the second frequency should be at least 10% greater, suitably at least 50% greater, or 100-800% greater, alternatively 125-500% greater, or as another alternative 200-400% greater than the first frequency.

As mentioned, in another embodiment, first filaments 12 comprise a first elastomer or elastomer blend, and second filaments 16 comprise a different elastomer or elastomer blend, having different tensile properties than the first elastomer or elastomer blend. In another desired embodiment, first filaments 12 comprise a first elastomer and second filaments 16 comprise an elastomer blend having a different percentage amount of the first elastomer, with an added non-elastic component, making the modulus of the second elastomer blend greater than the modulus of the first elastomer. This added non-elastic component also increases the set properties of the second elastomer blend relative to the first elastomer blend. For example, the second filaments may comprise KRATON® G1730 as a base elastomer, and a polyethylene wax as a processing aid. The first filaments may include the same base elastomer without the polyethylene wax, or with a lower amount of it. The combination of higher modulus and higher set properties of the second filaments provides a TEL 5 that has higher tension second filaments that can be wound up into a roll with a flat profile.

In another desired embodiment, second filaments 16 may comprise a blend of elastomers, for example KRATON® styrene-ethylene/propylene rubber and a polyethylene elastomer, having a modulus and/or basis weight (and, thus, tension) greater than a modulus and/or basis weight of a first elastomer used to form first filaments 12. The polyethylene elastomer additive increases the modulus and achieves the desired set properties for the second filaments 16 while also acting as a processing aid. This combination of first and second filaments produces a TEL material that can be wound up in a roll with a flat profile. More specifically, a TEL 5 having a high tension zone with less retraction than a low tension zone allows the TEL to be wound onto a roll so that the roll has a uniform diameter across

the width of the roll such that when the TEL is unwound from the roll, it lays flat on a processing surface.

In one embodiment of this invention, TEL 5 is produced by a vertical continuous filament stretch-bonded laminate method (VF SBL), as shown in Figs. 20-23. Referring to Fig. 20, an extruder (not shown) supplies molten elastomeric material to a first die 30. First die 30 includes different regions of spinning holes tailored to provide the nonwoven fabric 6 with higher and lower zones of elastic tension, having higher and lower basis weights as explained with respect to Figs. 4-8.

Referring to Fig. 20, molten elastomeric material is extruded from first spin plate region 32 through spinning holes as a plurality of (preferably continuous) elastomeric first filaments 12. Similarly, a plurality of (preferably continuous) elastomeric second filaments 16 of the same polymer material are extruded from second spin plate region 34 through spinning holes of different average diameter and/or frequency. The resulting nonwoven layer 6 has a higher basis weight in the zone defined by second filaments 16, than in the zone defined by first filaments 12. The different basis weights are selected to give the desired different elastic tensions. After extruding first and second filaments 12, 16, first and second filaments 12, 16 are quenched and solidified.

In another embodiment of this invention, TEL 5 is produced by the vertical continuous filament stretch-bonded laminate method (VF SBL), as shown in Figs. 24 and 25. Referring to Fig. 24, a first extruder (not shown) supplies a first molten elastomeric polymer or polymer blend to a first die 30. A second extruder (not shown) supplies a second molten elastomeric polymer or polymer blend to a second die 36. First die 30 extrudes the lower tension (desirably continuous) elastomeric filaments 12. Second die 36 extrudes the higher tension (desirably continuous) elastomeric filaments 16. The bands of filaments 12 and 16 may be joined together side-by-side to form a nonwoven layer 80 as shown in Fig. 12, having homogeneous high and low tension regions 85 and 87. Alternatively, a narrower band of higher elastomeric filaments 16 may be extruded over a wider band of filaments 12 to form a nonwoven layer 80 having a heterogenous higher tension region 85 and homogeneous lower tension regions 87 as shown in Fig. 14.

After extruding first and second filaments 12, 16, first and second filaments 12, 16 are quenched and solidified. In one desired embodiment, first and second filaments 12, 16 are quenched and solidified by passing first and second filaments 12, 16 over a first series of chill rolls 44. First series of chill rolls 44 may comprise one or more individual chill rolls 45, suitably at least two chill rolls 45 and 46, as shown in Figs. 20 and 24. Any number of chill rolls can be used. For instance, first filaments 12 may be contacted with chill roll 46. Second filaments 16, having a higher aggregate basis weight, may be passed over two chill rolls 45 and 46. Chill rolls 45, 46 can have a temperature of about 40°F to about 60°F.

The die of each extruder may be positioned with respect to the first roller so that the continuous filaments meet this first roller at a predetermined angle 47, shown in Figs. 20 and 24. This strand extrusion geometry is particularly advantageous for depositing a melt extrudate onto a rotating roll or drum. An angled, or canted, orientation provides an opportunity for the filaments to emerge from the die at a right angle to the roll tangent point resulting in improved spinning, more efficient energy transfer, and generally longer die life. This improved configuration allows the filaments to emerge at an angle from the die and follow a relatively straight path to contact the tangent point on the roll surface. The angle 47 between the die exit of the extruder and the vertical axis (or the horizontal axis of the first roller, depending on which angle is measured) may be as little as a few degrees or as much as 90°. For example, a 90° extrudate exit to roller angle could be achieved by positioning the extruder directly above the downstream edge of the first roller and having a side exit die tip on the extruder. Moreover, angles such as about 20°, about 35°, or about 45° away from vertical may be utilized. It has been found that, when utilizing a 12-filament/inch spinplate hole density, an approximately 45° angle (shown in Figs. 20 and 24) allows the system to operate effectively. The optimum angle, however, will vary as a function of extrudate exit velocity, roller speed, vertical distance from the die to the roller, and horizontal distance from the die centerline to the top dead center of the roller. Optimal performance can be achieved by employing various geometries to result in improved spinning efficiency and reduced filament breakage. In many cases, this results in potentially increased roll wrap resulting in

more efficient energy transfer and longer die life due to reduced drag and shear of the extrudate as it leaves the capillaries of the extruder die and proceeds to the chilled roll.

After first and second filaments 12, 16 are quenched and solidified, first and second filaments 12, 16 are stretched or elongated. In one desired embodiment, first and second filaments 12, 16 are stretched using a first series of stretch rolls 54. First series of stretch rolls 54 may comprise one or more individual stretch rolls 55, suitably at least two stretch rolls 55 and 56, as shown in Fig. 20 and 24. Stretch rolls 55 and 56 rotate at a speed greater than a speed at which chill rolls 45 and 46 rotate, thereby stretching the first and second filaments 12, 16.

In one embodiment of this invention, each successive roll rotates at a speed greater than the speed of the previous roll. For example, referring to Fig. 20, chill roll 45 rotates at a speed "x"; chill roll 46 rotates at a speed greater than "x", for example about "1.1x"; stretch roll 55 rotates at a still greater speed, for example about "1.15x"; second stretch roll 56 rotates at a still greater speed, for example about "1.25x" to about "2x"; and a third stretch roll 57 (if present, as in Fig. 25) rotates at a still greater speed, for example about "2x" to about "7x." As a result, first and second filaments 12, 16 can be stretched by about 100% to about 800% of an initial pre-stretched length, suitably by about 200% to about 700% of an initial pre-stretched length.

After first and second filaments 12, 16 are stretched, elastic nonwoven web 6 is laminated to a first facing material 18 and (alternatively) a second facing material 20. First facing material 18 is unwound from one of the rollers 62 and laminated to a first side of nonwoven layer 6. Second facing material 20 is unwound from one of the rollers 64 and laminated to a second side of nonwoven layer 6. As shown in Fig. 20, before second facing material 20 is laminated to a second side of elastic nonwoven layer 6, at least a portion of second facing material 20 can be coated or sprayed with an elastomeric adhesive 21, such as Findley H2525A, H2525 or H2096, via an adhesive sprayer 65. The laminate material is then passed through nip rolls 70. The laminate is then relaxed and/or retracted to produce a TEL 5. Other means for bonding the laminate material known to those having ordinary skill in the art may be used in place of nip roll 70.

Fig. 21 illustrates a VF SBL process similar to that of Fig. 20. In Fig. 21, instead of using a single spinnerette 30 having adjacent die regions for the high and low tension filament zones, two spinnerettes 30 and 36 are employed. First spinnerette 30 extrudes the first filaments 12. Second spinnerette 36 extrudes the second filaments 16. Again, the first and second spinnerettes differ as to the aggregate basis weights of the elastomeric filaments produced. The second spinnerette 36 may have die openings of a) higher frequency and/or b) higher diameter, than the die openings of the first spinnerette 30. Except for the use of two spinnerettes instead of one "hybrid" spinnerette, the processes of Figs. 20 and 21 are similar. In either case, the first filaments 12 and second filaments 16 ultimately converge to form a single elastic nonwoven layer 6 having zones of higher and lower elastic tensions. The filaments 12 and 16 may converge in a side-by-side fashion as shown in Fig. 1, for instance, to produce at least one lower basis weight, lower tension zone 10 and at least one higher tension, higher basis weight zone 14. Alternatively, the bands of filaments 12 and 16 may have different widths such that a narrower layer or band of second filaments 16 is superimposed directly over a wider layer band of filaments 12, so that the higher tension zone occurs where the two layers coexist. In either process, the first filaments 12 and second filaments 16 may converge as shown, at the chill roll 46.

Fig. 22 illustrates a VF SBL process in which the second filaments 16 are extruded, cooled and stretched independently from the first filaments 12. First filaments 12 are processed in a manner similar to that described with respect to Fig. 20. First filaments 12 are extruded from spinnerette 30, quenched using chill rolls 45 and 46, and stretched using stretch rolls 55, 56 and 57. Second filaments 16 are processed in parallel fashion (i.e., are extruded from second spinnerette 36), quenched using chill rolls 49 and 50, and stretched using stretch rolls 59 and 60. The first filaments 12 and second filaments 16 converge at the nip rolls 70 to form a nonwoven layer 6 as described above, which is simultaneously laminated between a first facing layer 18 and a second facing layer 20. The resulting laminate is then relaxed and/or retracted to form TEL 5. Except for the separate extrusion cooling and stretching of first and second filaments 12 and 16, the VF SBL process of Fig. 22 is similar to that of Fig. 20. An advantage of the process of Fig. 22 is the possibility

of having filaments 12 and 16 stretched by different amounts before lamination to the facing layers.

Fig. 23 illustrates a VF SBL process in which no stretch rolls 54 are used. Instead, first filaments 12 are extruded onto chill roll 46. Second filaments 16 are extruded onto chill roll 45, where the first filaments 12 and second filaments 16 converge to form a single elastic nonwoven layer 6 having zones of higher and lower elastic tensions. The first and second filaments 12, 16 are stretched between the chill rolls 45, 46 and the nip rolls 70. Except for the lack of stretch rolls 54, the processes of Figs. 21 and 22, as well as Figs. 22 and 24, are similar. In either case, the elastic nonwoven layer 6 is laminated between a first facing layer 18 and a second facing layer 20 at the nip rolls 70. The resulting laminate is then relaxed and/or retracted to form TEL 5.

Fig. 26 illustrates a method and apparatus for making an elastic laminate according to Figs. 15-18 and forming a targeted elastic material from the elastic laminate. The double filmed laminate of Fig. 19 would of course have another line added for forming the second film. While Fig. 26 illustrates a composite VF SBL process it will be appreciated that other processes consistent with the present invention may be utilized. A first extruder 426 produces strands of elastic material 428 through a filament die 427. The strands 428 are fed to a first chill roller 430 and stretched conveyed vertically towards a nip 432 by one or more first stretch rollers, collectively 434, in the strand-producing line.

A second extruder 436 using a slotted film die 437 produces a film of elastic material 438, of e.g. about 7.5" in width and ten (10) mils thickness, which is fed onto a second chill roller 440 and conveyed to one or more second stretch rollers, collectively 442, towards the nip 432. The film 438 may be stretched down to about two inches width and thinned to about 2 mils by the second stretch rollers 442 during its passage to the nip 432. The nip 432 is formed by opposing first and second nip rollers 444 and 446, respectively. The elastic laminate 410 (Fig. 15) is formed by securing the strands 428 to the film 438 in the nip 432 by heat, pressure, adhesives or combinations thereof. Adhesive sprayers, collectively 447, may be placed as desired on each material's path before entry into the nip.

Fig. 27 illustrates a VF SBL process in which no stretch rollers 434 are used. Instead, the film 438 is extruded onto chill roller 440. The strands 428 are extruded onto

chill roller 430, where the strands 428 and the film 438 converge. The strands 428 and the film 438 are stretched between the chill rollers 430, 440 and the nip 432. Except for the lack of stretch rollers 434, the processes of Figs. 26 and 27 are similar. In either case, the strands 428 and the film 438 together are laminated between a first facing layer 452 and a second facing layer 454 at the nip 432.

Figure 28 illustrates a side view of an extruder 15 in a canted position relative to the vertical axis of a roller 12. The 45° angle indicated on the Figure has been found to be one angle that produces an acceptable product and that allows the continuous filaments to mate with roller 12.

In order to form the TEM 456, first and second rolls 448 and 450, respectively, of spunbond facing material, 452 and 454, are fed into the nip 432 on either side of the elastic strands 428 and film 438 and bonded accordingly. The spunbond facing material might also be made *in situ* rather than unrolled from previously-made rolls of material. While illustrated as having two lightweight gatherable spunbond facings, it will be appreciated that only one facing material, or various types of facing materials, may be used. The bonded TEM 456 is maintained in stretched condition by a pair of tensioning rollers 458, 459 downstream of the nip and then relaxed as at Ref. No. 457.

The facing layer or layers 452, 454 may each include any of the facing materials described with respect to the previous embodiments. Also, the facing materials 452, 454 can be bonded to the elastomeric laminate 410 by using any of the techniques described with respect to the previous embodiments.

Fig. 29 illustrates a horizontal continuous filament stretch-bond laminate (CF SBL) process 100 for making the TEL of the invention. A first extrusion apparatus 130 (which can be a spinnerette, as described above) is fed with an elastomeric polymer or polymer blend from one or more sources (not shown). In various embodiments, the extrusion apparatus 130 can be configured according to the nonwoven web and die hole arrangements illustrated in Figs. 4-8 and described above, or similar arrangements, to form a nonwoven layer 106 having zones of higher and lower elastic tension. In another embodiment, the extrusion apparatus 130 can be configured with die holes of uniform size

and spacing, to yield a nonwoven layer 106 which has uniform elastic tension across its width.

The nonwoven layer 106 contains first filaments 112 which are substantially continuous in length. In this regard, the extrusion apparatus 130 may be a spinnerette. Suitably, apparatus 130 is a meltblowing spinnerette operating without the heated gas (e.g., air) stream which flows past the die tip in a conventional meltblowing process. Apparatus 130 extrudes filaments 112 directly onto a conveyor system, which can be a forming wire system 140 (i.e., a foraminous belt) moving clockwise about rollers 142. Filaments 112 may be cooled using vacuum suction applied through the forming wire system, and/or cooling fans (not shown). The vacuum can also help hold the nonwoven layer 106 against the foraminous wire system.

In a desired embodiment, at least one, possibly two or more second extrusion apparatus 136 are positioned downstream of the first extrusion apparatus 130. The second extrusion apparatus create one or more higher tension zones in the nonwoven layer 106 by extruding second filaments 116 of elastic material directly onto the nonwoven layer 106 in bands or zones which are narrower than the width of nonwoven layer 106. The second filaments 116 may be of the same or different elastic polymer construction, and/or the same or different size and basis weight, as the first filaments 112. The extrusion of second filaments 116 over the first filaments 112 only in selected regions of layer 106, operates to create higher elastic tension zones 114 where the first and second filaments 112 and 116 coexist, and lower elastic tension zones 110 where the first filaments 112 exist alone. The first and second filaments 112 and 116 converge, and are combined in the forming conveyor 140 as it travels forward, to yield nonwoven layer 108 having at least one first zone 110 of lower elastic tension, and at least one second zone 114 of higher elastic tension.

As explained above, nonwoven layer 108 can be produced either a) directly from spinnerette 130, which is configured to yield zones of higher and lower basis weight and elastic tension similar to Figs. 4-8, b) through the combined effect of spinnerette 130 as a uniform or nonuniform die, and secondary spinnerettes 136 which increase the basis weight and elastic tension in localized regions of layer 108 by extruding secondary filaments 116 onto layer 106, c) directly from spinnerette 130, which is configured to yield zones of

different polymer construction and higher and lower elastic tension, similar to Figs. 12-14, or d) through the combined effect of spinnerette 130 to yield a uniform or nonuniform precursor web 106, and secondary spinnerettes 136 which add filaments of different polymer construction and higher elastic tension in localized regions of layer 108 by extruding secondary filaments 116 onto layer 106. In any case, the nonwoven layer 108 (including filaments 112 and 116) may be incidentally stretched and, to an extent, maintained in alignment by moving the foraminous conveyor 140 in a clockwise machine direction, at a velocity which is slightly greater than the exit velocity of the filaments leaving the die.

To make the TEL 105, the elastic nonwoven layer 108 having higher and lower elastic tension zones is reinforced with one or more elastomeric meltblown layers made of the same or different elastic polymer material. Referring to Fig. 29, meltblowing extruders 146 and 148 are used to form meltblown layers 150 and 152 onto one side of layer 108, resulting in TEL 105. The meltblown layer or layers may act as structural facing layers in the laminate, and/or may act as adhesive layers if it is desired to add still more layers to the laminate.

Several patents describe various spray apparatuses and methods that may be utilized in supplying the meltblown layers (adhesives) to the outer facing(s) or, when desired, to the elastic strands themselves. For example, the following United States patents assigned to Illinois Tool Works, Inc. ("ITW") are directed to various means of spraying or meltblowing fiberized hot melt adhesive onto a substrate: 5,882,573; 5,902,540; 5,904,298. These patents are incorporated herein in their entireties by reference thereto. The types of adhesive spray equipment disclosed in the aforementioned patents are generally efficient in applying the adhesive onto the nonwoven outer facings in the VFL process of this invention. In particular, ITW-brand Dynatec spray equipment, which is capable of applying about 3 gsm of adhesive at a run rate of about 1100 fpm, may be used in the melt-spray adhesive applications contemplated by the present inventive process.

Representative adhesive patterns are illustrated in Figs. 31-37. Applying an adhesive in a cross-machine pattern such as the ones shown in Figures 36 and 37 may result in certain adherence advantages. For example, because the elastic strands are placed in the

machine direction, having the adhesive pattern orient to a large degree in the cross-machine direction provides multiple adhesives to elastic crossings per unit length.

In addition, in many particular embodiments of the present invention, the adhesive component is applied to the surface of the nonwoven layer in discrete adhesive lines. The adhesive may be applied in various patterns so that the adhesive lines intersect the elastic filament lines to form various types of bonding networks which could include either adhesive-to-elastic bonds or adhesive-to-elastic bonds, adhesive-to-facing layer, and adhesive-to-adhesive bonds. These bonding networks may include a relatively large total number of adhesive-to-elastic and adhesive-to-adhesive bonds that provide the laminated article with increased strength, while utilizing minimal amounts of adhesive. Such enhancements are achieved by the use of adhesive sprayed onto the surface of the nonwoven in a predetermined and specific pattern. In most cases, a final product with less adhesive exhibits a reduction in undesirable stiffness, and is generally more flexible and soft than products having more adhesive.

Applying the adhesive in a pattern so that the adhesive lines are perpendicular or nearly perpendicular to the elastic components has been found particularly advantageous. A true 90° bond angle may not be possible in practice, but an average or mean bond angle that is as great as 50° or 60° will generally produce a suitable bond between the elastic strands and the facing material. A conceptual illustration of these types of bond angles is shown in Figures 38 and 39. The adhesive-to-elastic bonds are formed where the lines of adhesive 448 and elastic strands 430 join or intersect.

The continuous adhesive filaments-to-elastic strand intersections are also controlled to a predetermined number of intersections per unit of elastic strand length. By having such adhesive lines in a perpendicular orientation and optimizing the number of bonds per unit of elastic strand length, the final elastic strand laminate can be produced with a minimal amount of adhesive and elastomeric strand material to provide desirable product characteristics at a lower cost.

If the adhesive-to-elastic bonds are too few in number or are too weak, then the elastic tension properties of the laminate may be compromised and the tension applied to the elastic strands may break the adhesive joints. In various known processes, the

common remedy for this condition is to increase the number of bonding sites by either increasing the meltspray air pressure, or by slowing the lamination speed. As the meltspray air pressure is increased, the resulting adhesive fiber size is reduced, creating weaker bonds. Increasing the amount of adhesive used per unit area to create larger adhesive filaments can strengthen these weaker bonds, which usually increases the cost of the laminate. Lowering the lamination speed decreases machine productivity, negatively impacting product cost. The present invention, in part, utilizes an effective bonding pattern where the number of bond sites per length elastic strand are prescribed and where the adhesive-to-elastic strand joints are generally perpendicular in orientation in order to provide maximum adhesive strength. This allows the laminate to be made at minimal cost by optimizing the adhesive and elastomer content to match the product needs.

As used herein, a "scrim" refers generally to a fabric or nonwoven web of material which may be elastic or inelastic, and having a machine direction ("MD") oriented strand component along the path of product flow during manufacture and a cross-machine direction ("CD") strand component across the width of the fabric.

Figure 31 shows one exemplary scrim pattern useful in the present invention in which the adhesive has been applied to the elastic filaments with attenuation of the adhesive lines in the cross-machine direction. Scrim pattern 435 includes adhesive lines 436 and elastic filaments 430. Figure 32 illustrates another exemplary scrim pattern 438 having adhesive lines 439 applied to elastic strands 430. In this embodiment, it can be seen that the bond angle is very high, approaching 90° at the intersection between the adhesive and the elastic filaments. Figure 33 illustrates still another scrim pattern 441 having adhesive lines 442 and continuous elastic strands 430.

As previously discussed, Figure 38 illustrates the relatively high bond angle that may be employed in products produced according to the present invention. In particular, lay down angle 444 is shown as the angle formed by the adhesive line 448 and the elastic strand 430. Adhesive/elastic angle 446 and adhesive/elastic angle 445 are shown as being less than 90°.

Figure 39 utilizes an exemplary bonding pattern to conceptually illustrate the measurement for determining the number of bonds per unit length on elastic strands or

filaments. Figure 34 shows another exemplary bonding pattern having the adhesive-to-adhesive bonding wherein a swirled type of configuration is employed. Figure 35 illustrates a more randomized pattern wherein a large percentage of adhesive lines are in a perpendicular, or almost perpendicular, orientation to the elastic filaments. Figure 36 is another exemplary embodiment of a bonding pattern having no adhesive-to-adhesive bonds, but numerous adhesive-to-elastic strand bonds. Figure 37 illustrates another exemplary bonding pattern that has both adhesive-to-adhesive and adhesive-to-elastic strand bonds. The configuration shown in Figure 37 is similar to the design of a chain-link fence.

Then, referring back to Fig. 29 for example, if it is desired to convert the TEL 105 into a stretch-bonded laminate, the TEL 105 may be stretched in a stretching stage 154 by pulling it between two nip rolls 156 and 158 which turn at a higher surface speed than the conveyor 140. At the same time, the facing layers 160 and 162 can be unwound from supply rollers 164 and 166, and laminated to the TEL 105 using the stretch roll assembly. To accomplish this dual purpose, the nip rolls 156 and 158 may be smooth or patterned calender rolls which use pressure to bond the materials 160, 105, 162 together as well as stretch the TEL 105. Alternatively, both heat and pressure may be applied to bond the materials 160, 105, 162 together. The resulting stretch-bonded laminate 170 may then be relaxed and/or retracted using nip rollers 172 and 174 that rotate at lower surface speed than calender rolls 158, and may be wound onto storage roll 176. The facing layers 160 and 162 may be any of the facing materials described above, and are suitably polyolefin-based spunbond webs.

Fig. 30 illustrates a hybrid of a CF SBL process and a VF SBL process for making a stretch-bonded TEL 170. A first extrusion apparatus 130 is fed with an elastic polymer or polymer blend from one or more sources (not shown). Extrusion apparatus 130 may be any of the various devices described with respect to Fig. 29. Suitably, apparatus 130 is a meltblowing spinnerette operating without the heated gas (e.g., air) stream which flows past the die tip in conventional meltblowing processes. Apparatus 130 extrudes lower tension filaments 112 directly onto a conveyor system, which can be a forming wire system 140 (i.e., a foraminous belt) moving clockwise about rollers 142. Filaments 112 may be cooled using vacuum suction applied through the forming wire system, and/or cooling fans (not shown). The vacuum may also help hold the filaments against the forming wire system.

A meltblowing extruder 146 is used to add a reinforcing elastic meltblown layer 150 to the elastic filaments 112. Suitably, the meltblown layer 150 is made of the same elastic polymer as the low tension filaments 112. The resulting laminate 107 travels forward on the conveyor.

To make the higher tension region, a vertical filament die 30 extrudes higher tension (i.e., higher basis weight or different polymer composition) elastic filaments 116 in a band which is narrower than the laminate 107 containing filaments 112. Filaments 116 pass around a chill roll 45, or a series of chill rolls, and a series of stretch rolls, for example three stretch rolls 55, 56 and 57, before being joined with laminate 107 between nip rolls 156 and 158, which are suitably smooth or patterned calender rolls. Simultaneously, facing layers 160 and 162 are unwound from supply rolls 164 and 166 and joined with the laminate between nip rolls 156 and 158 to make TEL 170. As TEL 170 is relaxed, it may assume the puckered configuration shown, due to retraction of high tension filaments 116 present in part of the laminate. TEL 170 may be flattened out between rolls 174 and 176, and wound onto roll 176.

TEL materials made according to the above-described embodiments of this invention can be employed in a wide variety of personal care absorbent garments including, for instance, diapers, training pants, swim wear, absorbent underpants, adult incontinence products, feminine hygiene products, baby wipes, and other personal care or medical garments, and the like. TEL materials are especially useful in absorbent articles requiring elastic in the waist and/or leg regions of a wearer. TEL materials can also be used in garments requiring different levels of tension within an elastic region. For ease of explanation, the following description is in terms of a refastenable child training pant having targeted elastic material used for containment flaps and a waist dam.

Referring to Fig. 40, a disposable absorbent garment 20, such as a child training pant, includes an absorbent chassis 32 and a fastening system 88. The absorbent chassis 32 defines a front waist region 22, a back waist region 24, a crotch region 26 interconnecting the front and back waist regions, an inner surface 28 which is configured to contact the wearer, and an outer surface 30 opposite the inner surface which is configured to contact the wearer's clothing. With additional reference to Figs. 41 and 42, the absorbent

chassis 32 also defines a pair of transversely opposed side edges 36 and a pair of longitudinally opposed waist edges, which are designated front waist edge 38 and back waist edge 39. The front waist region 22 is contiguous with the front waist edge 38, and the back waist region 24 is contiguous with the back waist edge 39. The chassis 32 defines waist opening 50 and two opposing leg openings 52.

The illustrated absorbent chassis 32 comprises a rectangular absorbent composite structure 33, a pair of transversely opposed front side panels 34, and a pair of transversely opposed back side panels 134. The composite structure 33 and side panels 34 and 134 may be integrally formed or comprise two or more separate elements, as shown in Fig. 40. The illustrated composite structure 33 comprises an outer cover 40, a bodyside liner 42 (Figs. 40 and 42) which is connected to the outer cover in a superposed relation, an absorbent assembly 44 (Fig. 42) which is located between the outer cover and the bodyside liner, and a pair of containment flaps 46 (Fig. 42). The rectangular composite structure 33 has opposite linear end edges 45 that form portions of the front and back waist edges 38 and 39, and opposite linear side edges 47 that form portions of the side edges 36 of the absorbent chassis 32 (Figs. 41 and 42). For reference, arrows 48 and 49 depicting the orientation of the longitudinal axis and the transverse axis, respectively, of the training pant 20 are illustrated in Figs. 41 and 42.

The front waist region 22 of the absorbent chassis 32 includes the transversely opposed front side panels 34 and a front center panel 35 (Figs. 41 and 42) positioned between and interconnecting the side panels. The back waist region 24 of the absorbent chassis 32 includes the transversely opposed back side panels 134 and a back center panel 135 (Figs. 41 and 42) positioned between and interconnecting the side panels. The waist edges 38 and 39 of the absorbent chassis 32 are configured to encircle the waist of the wearer when worn and provide the waist opening 50 which defines a waist perimeter dimension. Portions of the transversely opposed side edges 36 in the crotch region 26 generally define the leg openings 52.

In the embodiment shown in Fig. 40, the front and back side panels 34 and 134 are fastened together by fastening system 88 to form collective side panels 55 (with each collective side panel 55 including a front side panel 34 and back side panel 134). The

fastening system 88 may include a plurality of fastener tabs 82, 83, 84 and 85, which can be known hook-and-loop fastener members. It will be appreciated that any number of side panel configurations may be utilized in the context of the present invention.

The illustrated side panels 34 and 134, in Figs. 41 and 42, each define a distal edge 68 that is spaced from the attachment line 66, a leg end edge 70 disposed toward the longitudinal center of the training pant 20, and a waist end edge 72 disposed toward a longitudinal end of the training pant. The leg end edge 70 and waist end edge 72 extend from the side edges 47 of the composite structure 33 to the distal edges 68. The leg end edges 70 of the side panels 34 and 134 form part of the side edges 36 of the absorbent chassis 32. In the back waist region 24, the leg end edges 70 are desirably although not necessarily angled relative to the transverse axis 49 to provide greater coverage toward the back of the pant as compared to the front of the pant. The waist end edges 72 are desirably parallel to the transverse axis 49. The waist end edges 72 of the front side panels 34 form part of the front waist edge 38 of the absorbent chassis 32, and the waist end edges 72 of the back side panels 134 form part of the back waist edge 39 of the absorbent chassis.

Referring to Figs. 40-42, in accordance with the invention, the containment flaps 46, desirably continuous with the chassis 32, each include a targeted elastic material including an elasticized, low tension and/or high stretch zone 130 in the vicinity of (and aligned with) leg openings 52, and a narrow, band-like high tension and/or low stretch zone 131 in the vicinity of (and aligned with) the unattached, gasket-like edges 90 of the containment flaps 46 thereby creating a gasket at the gasket-like edges 90 of the containment flaps 46 (Fig. 42). The containment flaps 46 can be separate, attached pieces (as shown in Figs. 40 and 41), or can be an extension of the outer cover 40, as shown in Fig. 42. The dotted lines in Fig. 42 indicate the boundaries between the low tension and/or high stretch zone 130 and the high tension and/or low stretch zone 131, which boundaries are not visible to an observer. The low tension and/or high stretch zone 130 and the high tension and/or low stretch zone 131 are suitably spaced apart, as shown in Fig. 42. From the standpoint of the observer, the targeted elastic material forming the containment flaps 46 appears as a homogeneous, integrated material.

The high tension and/or low stretch zone 131 exhibits greater elastic tension and/or elongation than the low tension and/or high stretch zone 130 of the containment flaps 46, without requiring the use of separately manufactured and attached elastic materials. Furthermore, desired spacing between the high tension and/or low stretch zone 131 and the low tension and/or high stretch zone 130 allows the zones 131 and 130 to stretch independently of one another so as not to constrain elongation capacity of either zone 131 and 130.

To further enhance containment and/or absorption of body exudates, the training pant 20 desirably includes a waist dam having a front waist dam portion 54 and a rear waist dam portion 56 (Fig. 42) of a high tension and/or low stretch zone 133 in the vicinity of (and aligned with) the waist edges 38 and 39. The waist dam portions 54 and 56 can be separate, attached pieces, or can be extensions of the outer cover 40, as shown in Fig. 42. From the standpoint of the observer, the targeted elastic material forming the waist dam portions 54 and 56 appears as a homogeneous, integrated material.

The containment flaps 46 and the waist dam portions 54 and 56 are manufactured from a targeted elastic material. Various embodiments of targeted elastic materials may include the elastic laminate materials shown in Figs. 15-19.

The invention further encompasses various types of garments in which a high tension and/or low stretch gasketing elastic zone is present in the vicinity of any one or more garment openings. Depending on the garment, high tension and/or low stretch gasketing zones of a targeted elastic material may encircle an entire garment opening or just a portion of the garment opening. In addition to the training pant 20, other types of garments on which this invention can be used include personal care garments, such as diapers, absorbent underpants, adult incontinence products, certain feminine hygiene articles, and swim wear. The high tension and/or low stretch gasketing elastic zones may be used in similar fashion in medical garments including, for instance, medical gowns, caps, gloves, drapes, face masks, and the like, where it is desired to provide a gasket in the vicinity of one or more garment openings without requiring a separately manufactured and attached elastic band. Furthermore, the high tension and/or low stretch gasketing elastic zone can be used around

neck openings, arm openings, wrist openings, waist openings, leg openings, ankle openings, and any other opening surrounding a body part wherein fluid transfer resistance is desirable.

EXAMPLE 1

A roll of TE SBL was produced using the VF SBL method. The TE SBL included a web of continuous filaments laminated between two 0.4 osy polypropylene spunbond facing materials and bonded with Findley H2525A adhesive on one of the facing materials. The filaments of the low tension zone were produced with KRATON® G2760, available from Shell Chemical Co. of Houston, Texas, at a filament density of 8 filaments per inch. The high tension zone was created with the same KRATON® G2760 with the same diameter filaments as the low tension zone but at a 50% increase in filament density of 12 filaments per inch. These filaments were extruded from the same die, quenched over two chill rolls, stretched 4.25 times and laminated between the two facings. The high tension zone had an average tension at 50% elongation of 190 grams per inch. The low tension zone had an average tension at 50% elongation of 130 grams per inch.

EXAMPLE 2

A roll of TE SBL was produced using the VF SBL method. The TE SBL included a web of continuous filaments of two different polymers laminated between two 0.4 osy polypropylene spunbond facing materials and bonded with Findley H2525A adhesive on one of the facing materials. The filaments of the low tension zone were produced with a lower tension elastic polymer blend available from Shell Chemical Co. of Houston, Texas, containing 85% by weight KRATON® G1730 tetrablock polymer elastomer and 15% by weight, polyethylene wax, at a calculated basis weight of approximately 8 gsm from a first die. A 1 7/8-inch strip of filaments (approximately 28 gsm) forming a high tension zone were produced from a higher tension elastic polymer blend available from Shell Chemical Co., containing 70% by weight KRATON® G1730 tetrablock copolymer elastomer and 30% by weight polyethylene wax; with 1 part by weight SCC 19202 blue pigment available from Standridge Color Corp. of South Carolina; was laid down among the lower tension filaments. The higher tension filaments were stretched approximately 5.5x post chill roll and the lower tension filaments were stretched approximately 6x post chill roll. The low tension zone had a tension of about 300 grams per 3-inch sample at 50% elongation. The high tension zone

had a tension of about 600 grams per 3-inch sample at 50% elongation. The variance in roll diameter of the finished roll was less than 5 mm across the material width for a 53" diameter roll.

EXAMPLE 3

A roll of TE SBL material was produced using the VF SBL method. The TE SBL included a web of continuous filaments including two different polymers laminated between two 0.4 osy polypropylene spunbond facing materials and bonded with Findley H2525A adhesive on one facing material. The filaments of the low tension zone were produced as in Example 2, at a calculated basis weight of approximately 8 gsm. A 1 7/8-inch strip of filaments forming a high tension zone included a dry blend of 70% by weight KRATON®G1730 tetrablock polymer elastomer, 12% by weight polyethylene wax, and 18% Dow metallocene-catalyzed polyethylene (density of 0.89 grams/cc), blended 80:1 with SCC 19202 pigment at an average basis weight of 19 gsm. The high tension filaments were positioned between the low tension filaments in a 1 7/8-inch strip. The low tension filaments were stretched approximately 6x post chill roll and the high tension filaments were stretched approximately 5.5x post chill roll. The low tension zone had a tension of about 400 grams per 3-inch sample at 50% elongation. The high tension zone had a tension of about 700 grams per 3-inch sample at 50% elongation. The variance in roll diameter of the finished roll was less than 5 mm across a width of the material for a 45" diameter roll.

EXAMPLE 4

In an assembly known as the Vertical Filament Laminator (VFL), strands of an elastomeric polymer made up of 65.5% KRATON® G1730, 12% of a low molecular weight polyethylene wax, NA 601, and 22.5% of a pressure sensitive adhesive such as Regalrez™ of Hercules Inc., of Wilmington, DE, were extruded onto the top of a chill roll. The elastic strands were subsequently stretched successively through a series of rolls stacked in a vertical fashion, one on top of each other, under the chill roll and into a pair of nip rolls, i.e. rolls creating a nip. In the nip, the facing sheets and tackified elastic strands meet whereupon the strands are bonded to the facings, under pressure, to form a gathered but stretchable laminate. Alternatively, an external hot melt adhesive can be sprayed on the

facing sheets, prior to entering the nip, in order to bond a non-tackified elastomer to the facing sheets.

In the VFL assembly, a film of the same elastomer was cast from a second extruder using a slotted film die at a width of 7.5 inches and approximately 10 mil thick adjacent to the strands. Because of the close proximity of the strands and film they make contact with each other at the initial cooling roller. The film width, initially at 7.5 inches, narrowed to 2 inches when passed over all the rolls, which were run at differential speed together with the strands. The film also thinned down to approximately 2 mils thickness in the final gathered laminate after passing through the nip. A difficulty was perceived in introducing the film and strands on top of the same chill roll together.

A second approach was adopted for the successful development of the film based banded or targeted elastic laminate by casting the film onto a separate chill roll using the slotted film die. The film was guided to the nip through one or more stretch rolls and laminated together with the strands between the facings. In this construction, no attempt was made to separate the strands from the area in which film was present, the strand was laid just on top of the film. In other words, the strand lay down had no discontinuity. The stretch of the film and strands from their extruders had to be identical to produce a laminate with uniform gathering. To achieve a differential gathering of the elastic targeted zones, a differential stretch prior to bonding is recommended. The initial width and gap of the film die was adjusted to effect the width and thickness of the film in the final laminate. Alternatively, the forming distance (distance between the die and the chill roll), chill roll speed and polymer throughput can also be adjusted to change the dimensions of the film. It was observed during the processing that an increase in stretch of the elastomer to achieve a higher stretch to stop (STS) of 230-260%, when compared with a control material of 80-190% STS, results in delamination of the strands from the film. Use of excess adhesive in the elastomeric materials also results in reduction of stretch to stop of the laminate. Hence 1 gsm of a Findley 2096 adhesive was melt sprayed on the facing in addition to the tackifier present in the elastomer formulation which resulted in excellent adhesion and provided 230%+ elongation. Another observation made during the production of the elastic laminate was that the film chill roll temperature had to be around 25°C to prevent the film from

breaking. Of course, different formulations of laminate components may require different temperature controls.

EXAMPLE 5

In this example, targeted elastic materials were tested in terms of stress relaxation at body temperature, a 3-cycle hysteresis test, and stress elongation. In the stress relaxation test, the samples tested included TE made up of a film including 65.5% KRATON® G1730, 12% of a low molecular weight polyethylene wax, NA 601, and 22.5% of a pressure sensitive adhesive such as Regalrez™, and filaments including 80% KRATON® G1730, 13% tackifier, and 7% wax, with the filaments overlaid on the film. Non-TE portions of a laminate were based solely on the filaments made up of 80% KRATON® G1730, 13% tackifier, and 7% wax. The control sample used in the stress relaxation test was a laminate based on LYCRA® spandex, available from E. I. Du Pont de Nemours Co., in a non-TE type laminate material construction. In the hysteresis test, the samples included a TE sample of film made up of 65.5% KRATON® G1730, 12% of a low molecular weight polyethylene wax, NA 601, and 22.5% of a pressure sensitive adhesive such as Regalrez™, together with filament made up of 85% KRATON® G1730 and 15% wax, and a filament-based non-TE sample made up of 80% KRATON® G1730, 13% tackifier, and 7% wax. The control sample was the side panel material used in the PULL-UPS® Disposable Training Pant, based on KRATON® G 2760 polymer. In the stress elongation test, the samples included a TE sample of film made up of 65.5% KRATON® G1730, 12% of a low molecular weight polyethylene wax, NA 601, and 22.5% of a pressure sensitive adhesive such as Regalrez™, together with filament made up of 85% KRATON® G1730 and 15% wax, a filament-based non-TE sample of 80% KRATON® G1730, 13% tackifier, and 7% wax, and a control of filament-based non-TE sample of KRATON® 2760, which is the commercial side panel material used in PULL-UPS® Disposable Training Pants.

Stress Relaxation at Body Temperature

Stress relaxation of the elastomer at body temperature is used mainly for rating the dimensional stability of the material. Stress relaxation is defined as the force required to hold a given elongation constant over a period of time. Hence, it is a transient response which mimics personal care products in use. In this experiment, the load loss

(stress relaxation) as a function of time was measured at body temperature. The rate of change of the property as a function of time was obtained by calculating the slope of a log-log regression of the load and time. In addition to the rate of loss as a function of time, the percentage of load loss was calculated from the knowledge of the initial and final loads. The duration of the experiment was matched with the time a product stays on the body in real use. A perfectly elastic material, such as a metal spring, for instance, is expected to give a value of zero for both slope and load loss.

In the stress relaxation characterization, a 3-inch width of the laminate specimen was used for the test. Samples were tested in a Sintech mechanical test frame in an environmental chamber at 100°F (38°C). An initial 3-inch grip-to-grip distance was displaced to a final 4.5 inches (50% elongation) at a cross-head displacement speed of 20 inches/minute. The load loss as a function of time was then acquired over a period of 12 hours using the Testworks data acquisition capability of the MTS Sintech test equipment.

Fig. 43 shows the stress relaxation behavior of the TE and non-TE portions of the laminate. Table 1, below, shows the load decay rates and load loss at the end of 12 hours for the TE and non-TE materials. LYCRA® spandex was included as a control.

Table 1

Laminate	Load Decay Rate	% Load Loss (12 hr)
Control (CFSBL)	-0.08	50
TE Zone	-0.07	48
Non-TE Zone	-0.08	49
LYCRA® spandex	-0.02	10

3-Cycle Hysteresis Test

Equilibrium hysteresis behavior of the polymers was obtained by ramping a rectangular specimen up to 160% and down to 0% elongation at 20 inches/minute at room temperature. The procedure was repeated 3 times. Most of the samples attained equilibrium in 2 to 3 up-and-down ramping cycles.

The three curves shown in Fig. 44 are for the targeted high-tension TEM, the control (PULL-UPS® Disposable Training Pants with uniform tension), and the low tension

targeted elastic laminates. The curves also serve the purpose of illustrating the donning process to which a product might be subjected before putting the product on the user. It can be seen from the figure that each material loses some of its tension on the second and third loading in comparison with the first loading cycle. However, the tension remains relatively constant for all three unloading cycles. The second and third loading cycles have similar loading tensions as a function of elongation. It can also be seen that in all cases some of the lost load on unloading is restored on the loading cycles. The figure illustrates that the tension of the control is in between the targeted and non-targeted elastic materials.

Stress Elongation

The stress-elongation behavior of the laminates was obtained at room temperature using a Sintech 1/S testing frames. Rectangular laminate samples having 3-inch widths were clamped at a grip-to-grip distance of 3 inches and were pulled at a cross-head displacement of 20 inches/minute. Samples were stretched to approximately 2000 grams load limit. The elongation was calculated from knowledge of the change in length and the original length of the sample. The tension at 50% elongation was calculated from the data acquired.

Fig. 45 shows the stress elongation curves for the TE, non-TE and control laminate samples. The TE portion was a 2" wide film made up of 65.5% KRATON® G1730, 12% of a low molecular weight polyethylene wax, NA 601, and 22.5% of a pressure sensitive adhesive such as Regalrez™, on top of strands of 85% KRATON® G1730 and 15% wax, of less than 0.03 inch diameter at 12 strands per inch. The number of strands per inch and the thickness of the TE film can be changed independently or in combination, to alter the load-elongation characteristics of the elastic laminate material. The 3-inch samples tested had 1 to 2.5-inch wide film and elastic strand overlaid on it. The additional 0.5 to 2 inches of material consisted of the non-TE portion. In other words, TE samples tested had a width of 3 inches consisting of both TE and non-TE portions. The TE and non-TE portions could also be tested separately to define the material specifications. It can be seen from Fig. 45 that the tension as a function of elongation is lower (up to about 150%) for the non-TE portions and higher for the TE portions. The TE panel also provides an additional advantage. Having a higher tension as a function of elongation of the side panel material means that when the TE

panel stress decays as a function of time at body temperature, it will still be at a higher tension than the control and non-TE material after a given period of time. For example, consider the TE material, which has 674 grams at 50% elongation. Examination of Table 1 shows that this material stress relaxes 50% in 12 hours at body temperature. This implies that after 12 hours the material will be at a load of 324 grams. Compare this value with the control, which is at 415 grams at 50% elongation and it stress relaxes 50% after 12 hours. Fifty percent of 415 is 208 grams. Thus the TE material is at 116 grams higher than the control at the end of 12 hours which delivers better tension to the body and therefore better body fit over time.

While the embodiments of the invention described herein are presently preferred, various modifications and improvements can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated in the appended claims, and all changes that fall within the meaning and range of equivalents are intended to be embraced therein.

WHAT IS CLAIMED:

1. A targeted elastic laminate material, comprising:

at least one low tension zone, the low tension zone including a plurality of elastomeric first filaments, the low tension zone having a first basis weight;

at least one high tension zone, the high tension zone including a plurality of elastomeric second filaments, the high tension zone having a second basis weight higher than the first basis weight; and

a facing layer bonded to at least a first side of the low tension zone and a first side of the high tension zone.

2. The targeted elastic laminate material of Claim 1, wherein the second basis weight is at least 10% greater than the first basis weight.

3. The targeted elastic laminate material of Claim 1, wherein the second basis weight is at least 50% greater than the first basis weight.

4. The targeted elastic laminate material of Claim 1, wherein the second basis weight is about 100% to about 800% greater than the first basis weight.

5. The targeted elastic laminate material of Claim 1, wherein the second basis weight is about 125% to about 500% greater than the first basis weight.

6. The targeted elastic laminate material of Claim 1, wherein the second basis weight is about 200% to about 400% greater than the first basis weight.

7. The targeted elastic laminate material of Claim 1, wherein the first basis weight is about 2 gsm to about 14 gsm and the second basis weight is about 10 gsm to about 32 gsm.

8. The targeted elastic laminate material of Claim 1, wherein the first basis weight is about 4 gsm to about 12 gsm and the second basis weight is about 12 gsm to about 30 gsm.

9. The targeted elastic laminate material of Claim 1, wherein the first filaments have a first average thickness and the second filaments have a second average thickness greater than the first average thickness.

10. The targeted elastic laminate material of Claim 9, wherein each of the first average thickness and the second average thickness is about 0.010 inch to about 0.040 inch.

11. The targeted elastic laminate material of Claim 9, wherein each of the first average thickness and the second average thickness is about 0.020 inch to about 0.032 inch.

12. The targeted elastic laminate material of Claim 1, wherein the first filaments have a first frequency and the second filaments have a second frequency higher than the first frequency.

13. The targeted elastic laminate material of Claim 12, wherein the first filaments have a first frequency and the second filaments have a second frequency of about 4 hpi to about 40 hpi.

14. The targeted elastic laminate material of Claim 12, wherein the first filaments have a first frequency and the second filaments have a second frequency of about 12 hpi to about 30 hpi.

15. The targeted elastic laminate material of Claim 1, wherein the low tension zone and the high tension zone are bonded to the facing layer with an elastomeric adhesive.

16. The targeted elastic laminate material of Claim 1, wherein the facing layer comprises an elastomeric meltblown web.

17. The targeted elastic laminate material of Claim 1, further comprising a second facing layer bonded to a second side of the low tension zone and a second side of the high tension zone.

18. The targeted elastic laminate material of Claim 1, wherein the first elastomeric filaments and the second elastomeric filaments comprise a polymer selected from the group consisting of styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-ethylene/butylene-styrene block copolymers, styrene-ethylene-propylene-styrene-ethylene-propylene tetrablock copolymers, styrene-ethylene-propylene-styrene block copolymers, polyurethanes, elastomeric polyamides, elastomeric polyesters, elastomeric polyolefin homopolymers and copolymers, atactic polypropylenes, ethylene vinyl acetate copolymers, single-site or metallocene catalyzed polyolefins having a density less than about 0.89 grams/cc, and combinations thereof.

19. The targeted elastic laminate material of Claim 1, wherein the first elastomeric filaments and the second elastomeric filaments comprise substantially the same polymer composition.

20. The targeted elastic laminate material of Claim 1, wherein the low tension zone is laterally adjacent to the high tension zone.

21. The targeted elastic laminate material of Claim 1, wherein each of the first facing layer and the second facing layer comprises a material selected from a nonwoven web, a woven web and a film.

22. The targeted elastic laminate material of Claim 1, wherein each of the first facing layer and the second facing layer comprises a spunbond material.

23. The targeted elastic laminate material of Claim 1, wherein the low tension zone has a first tension and the high tension zone has a second tension greater than the first tension.

24. A garment comprising the targeted elastic laminate material of Claim 1.

25. A method of producing a targeted elastic laminate material, comprising the steps of:

extruding a plurality of elastomeric first filaments from a plurality of spinning holes in at least one first spin plate region;

extruding a plurality of elastomeric second filaments from a plurality of spinning holes in at least one second spin plate region, the second filaments having a greater basis weight than a basis weight of the first filaments;

cooling the first and second filaments;

stretching the first and second filaments;

forming a laminate material by adhering the stretched first and second filaments to a first facing material and an opposing second facing material; and

relaxing the laminate material.

26. The method of Claim 25, wherein the first and second filaments are stretched by about the same amount.

27. The method of Claim 25 wherein the first filaments are stretched by a different amount than the second filaments.

28. The method of Claim 25, wherein the first and second filaments are stretched by about 100% to about 800% of an initial length.

29. The method of Claim 25, wherein the first and second filaments are substantially continuous.

30. The method of Claim 25, wherein the first spin plate region has spinning holes with a first diameter and the second spin plate region has spinning holes with a second diameter greater than the first diameter.

31. The method of Claim 25, wherein the first spin plate region has a first frequency of spinning holes and the second spin plate region has a second frequency of spinning holes greater than the first frequency.

32. The method of Claim 25, wherein the cooling step is accomplished by passing the first and the second filaments over a series of chill rolls.

33. The method of Claim 25, wherein the cooling step is accomplished by placing the first and second filaments on a foraminous belt and applying a vacuum through the belt.

34. The method of Claim 25, wherein the stretching step is accomplished by passing the first and second filaments over a series of stretch rolls.

35. The method of Claim 34, wherein the series of stretch rolls comprises a first stretch roll and a second stretch roll, the first stretch roll rotates at a first speed and the second stretch roll rotates at a second speed greater than the first speed.

36. The method of Claim 25, wherein a low tension zone comprises first filaments having a first tension and a high tension zone comprises second filaments having a second tension greater than the first tension.

37. The method of Claim 25, wherein the second filaments form a high tension zone that overlaps a portion of a low tension zone formed by the first filaments.

38. A method of producing a targeted elastic laminate material, comprising the steps of:

extruding a plurality of elastomeric first filaments from a first spinning system having at least one first die, the first die having at least one spin plate region with a plurality of first spinning holes;

extruding a plurality of elastomeric second filaments from a second spinning system having at least one second die, the second die having at least one spin plate region with a plurality of second spinning holes, the second filaments having a greater basis weight than a basis weight of the first filaments;

cooling the first and second filaments;

stretching the first and second filaments;

forming a laminate material by adhering the stretched first and second filaments to a first facing material and an opposing second facing material; and

relaxing the laminate material.

39. The method of Claim 38, wherein the first filaments are cooled by placing the first filaments on a foraminous belt and applying a vacuum through the belt, and the second filaments are cooled by passing the second filaments through a series of chill rolls.

40. The method of Claim 39, wherein the first filaments are stretched by passing the first filaments through a first series of stretch rolls and the second filaments are stretched by passing the second filaments through a second series of stretch rolls.

41. The method of Claim 40, wherein the amount of stretching of the first and second filaments is independently controlled.

42. The method of Claim 38, wherein the first filaments are cooled by passing the first filaments through a first series of chill rolls and the second filaments are cooled by passing the second filaments through a second series of chill rolls.

43. The method of Claim 42, wherein the first filaments are stretched by passing the first filaments through a first series of stretch rolls and the second filaments are stretched by passing the second filaments through a second series of stretch rolls.

44. The method of Claim 43, wherein the amount of stretching of the first and second filaments is independently controlled.

45. The method of Claim 38, wherein the second filaments form a high tension zone that overlaps at least a portion of a low tension zone formed by the first filaments.

46. The method of Claim 38, further comprising the step of aligning the first filaments and the second filaments during the stretching step.

47. The method of Claim 38, wherein a barrier layer is positioned between the first facing material and the second facing material before the laminate material is bonded.

48. The method of Claim 38, wherein the first and second filaments are stretched by about 50% to about 300% of an initial length.

49. A disposable garment comprising a targeted elastic laminate material, the targeted elastic laminate material comprising:

at least one low tension zone, the low tension zone having a plurality of elastomeric first filaments, the first filaments having a first basis weight;

at least one high tension zone, the high tension zone having a plurality of elastomeric second filaments, the second filaments having a second basis weight higher than the first basis weight;

a facing material bonded to at least a first side of the low tension zone and a first side of the high tension zone.

50. The disposable garment of Claim 49, wherein the first and second filaments comprise substantially continuous filaments.

51. The disposable garment of Claim 49, comprising a diaper.

52. The disposable garment of Claim 49, comprising training pants.

53. The disposable garment of Claim 49, comprising swim wear.

54. The disposable garment of Claim 49, comprising absorbent underpants.

55. The disposable garment of Claim 49, comprising a baby wipe.

56. The disposable garment of Claim 49, comprising an adult incontinence product.

57. The disposable garment of Claim 49, comprising a feminine hygiene product.

58. The disposable garment of Claim 49, comprising a protective garment.

59. A targeted elastic laminate material, comprising:

at least one low tension zone, the low tension zone including a plurality of elastomeric first filaments, the first filaments including a first elastomeric polymer;

at least one high tension zone, the high tension zone including a plurality of elastomeric second filaments, the second filaments including a second elastomeric polymer; and

a facing material bonded to at least a first side of the low tension zone and a first side of the high tension zone.

60. The targeted elastic laminate material of Claim 59, wherein the first filaments and the second filaments each comprise a base polymer selected from the group consisting of styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-ethylene/butylene-styrene block copolymers, styrene-ethylene/propylene-styrene-ethylene/propylene tetrablock copolymers, styrene-ethylene/propylene-styrene block copolymers, polyurethanes, elastomeric polyamides, elastomeric polyesters, elastomeric polyolefin homopolymers and copolymers, atactic polypropylenes, ethylene vinyl acetate copolymers, single-site or metallocene catalyzed polyolefins having a density less than about 0.89 grams/cc, and combinations thereof.

61. The targeted elastic laminate material of Claim 60, wherein the first filaments and the second filaments comprise the same base polymer, in different percentage amounts.

62. The targeted elastic laminate material of Claim 60, wherein the first filaments comprise a first base polymer and the second filaments comprise a second base polymer different from the first base polymer.

63. The targeted elastic laminate material of Claim 61, wherein the second filaments comprise the base polymer and a processing aid.

64. The targeted elastic laminate material of Claim 61, wherein the first and second filaments comprise the base polymer and a processing aid, in different percentage amounts.

65. The targeted elastic laminate material of Claim 63, wherein the processing aid comprises a polyethylene wax.

66. The targeted elastic laminate material of Claim 59, wherein the high tension zone has an elastic tension at least 10% greater than the low tension zone.

67. The targeted elastic laminate material of Claim 59, wherein the high tension zone has an elastic tension at least 50% greater than the low tension zone.

68. The targeted elastic laminate material of Claim 59, wherein the high tension zone has an elastic tension about 100% to about 800% greater than the low tension zone.

69. The targeted elastic laminate material of Claim 59, wherein the high tension zone has an elastic tension about 125% to about 500% greater than the low tension zone.

70. The targeted elastic laminate material of Claim 59, wherein the high tension zone has an elastic tension about 200% to about 400% greater than the low tension zone.

71. The targeted elastic laminate material of Claim 59, wherein the high tension zone is formed by placing the second filaments among some of the first filaments.

72. The targeted elastic laminate material of Claim 59, wherein the high tension zone is formed by placing the second filaments in a separate, non-overlapping region from the first filaments.

73. The targeted elastic laminate material of Claim 59, wherein the facing material comprises a material selected from a nonwoven web, a woven web and a film.

74. The targeted elastic laminate material of Claim 59, wherein the facing material comprises a spunbond material.

75. The targeted elastic laminate material of Claim 59, wherein the facing material comprises a meltblown continuous filament composite web.

76. The targeted elastic laminate material of Claim 59, further comprising a second facing material bonded to a second side of the low tension zone and a second side of the high tension zone.

77. The targeted elastic laminate material of Claim 59, wherein the low tension zone and the high tension zone are bonded to the facing material with an elastomeric adhesive.

78. A wound up roll of substantially uniform diameter comprising the material of Claim 59.

79. A garment comprising the targeted elastic laminate material of Claim 59.

80. A method of producing a targeted elastic laminate material, comprising the steps of:

extruding a plurality of elastomeric first filaments having a first elastomeric composition, from a first spinning system;

extruding a plurality of elastomeric second filaments having a second elastomeric composition, from a second spinning system;

cooling the first and second filaments;

stretching the first and second filaments;

forming a laminate material by adhering the stretched first and second filaments to a first facing material and an opposing second facing material; and

relaxing the laminate material.

81. The method of Claim 80, wherein the first spinning system comprises a first die having at least one spin plate region with a plurality of spinning holes.

82. The method of Claim 80, wherein the second spinning system comprises a second die having at least one spin plate region with a plurality of spinning holes.

83. The method of Claim 80, wherein the cooling step is accomplished by passing the first and the second filaments over a series of chill rolls.

84. The method of Claim 80, wherein the cooling step is accomplished by placing the first and second filaments on a foraminous belt and applying a vacuum through the belt.

85. The method of Claim 80, wherein the stretching step is accomplished by passing the first and second filaments over a series of stretch rolls.

86. The method of Claim 85, wherein the series of stretch rolls comprises a first stretch roll and a second stretch roll, the first stretch roll rotates at a first speed and the second stretch roll rotates at a second speed greater than the first speed.

87. The method of Claim 80, wherein the second spinning system further comprises a third die.

88. The method of Claim 80, wherein the first filaments define a lower tension zone and the second filaments define a higher tension zone.

89. The method of Claim 80, wherein the first and second filaments are substantially continuous.

90. The method of Claim 80, wherein the first filaments comprise a first elastomer and the second filaments comprise a second elastomer different from the first elastomer.

91. The method of Claim 80, wherein the first filaments comprise a first elastomer blend and the second filaments comprise a second elastomer blend different from the first elastomer blend.

92. The method of Claim 80, wherein the first filaments comprise a first elastomer and the second filaments comprise a different percentage amount of first elastomer.

93. The method of Claim 80, wherein the second filaments form a high tension zone that overlaps at least a portion of a low tension zone formed by the first filaments.

94. The method of Claim 80, wherein the first filaments are cooled by passing the first filaments through a first series of chill rolls and the second filaments are cooled by passing the second filaments through a second series of chill rolls.

95. The method of Claim 94, wherein the first filaments are stretched by passing the first filaments through a first series of stretch rolls and the second filaments are stretched by passing the second filaments through a second series of stretch rolls.

96. The method of Claim 95, wherein the amount of stretching of the first and second filaments is independently controlled.

97. The method of Claim 80, wherein the first filaments are cooled by placing the first filaments on a foraminous belt and applying a vacuum through the belt, and the second filaments are cooled by passing the second filaments through a second series of chill rolls.

98. The method of Claim 97, wherein the first filaments are stretched by passing the first filaments through a first series of stretch rolls and the second filaments are stretched by passing the second filaments through a second series of stretch rolls.

99. The method of Claim 98, wherein the amount of stretching of the first and second filaments is independently controlled.

100. The method of Claim 80, wherein the first and second filaments are stretched by about the same amount.

101. The method of Claim 80, wherein the first filaments are stretched by a different amount than the second filaments.

102. The method of Claim 80, wherein the first and second filaments are stretched by about 25% to about 800% of an initial length.

103. The method of Claim 80, wherein the first and second filaments are stretched by about 50% to about 700% of an initial length.

104. The method of Claim 80, further comprising the step of aligning the first filaments and the second filaments during the stretching step.

105. The method of Claim 80, wherein a barrier layer is positioned between the first facing material and the second facing material before the laminate material is bonded.

106. The method of Claim 80, wherein the second spinning system comprises a plurality of individually controllable spin plate regions.

107. The method of Claim 80, wherein the second spinning system further comprises a third die having a spin plate region with a plurality of spinning holes.

108. A disposable garment comprising a targeted elastic laminate material, the targeted elastic laminate material comprising:

at least one low tension zone, the low tension zone having a plurality of first filaments made of a first elastomeric polymer composition;

at least one high tension zone, the high tension zone having a plurality of second filaments made of a second elastomeric polymer composition;

a facing material bonded to at least a first side of the low tension zone and a first side of the high tension zone.

109. The disposable garment of Claim 108, wherein the first and second filaments comprise substantially continuous filaments.

110. The disposable garment of Claim 108, comprising a diaper.

111. The disposable garment of Claim 108, comprising training pants.

112. The disposable garment of Claim 108, comprising swim wear.

113. The disposable garment of Claim 108, comprising absorbent underpants.

114. The disposable garment of Claim 108, comprising a baby wipe.

115. The disposable garment of Claim 108, comprising an adult incontinence product.

116. The disposable garment of Claim 108, comprising a feminine hygiene product.

117. The disposable garment of Claim 108, comprising a protective garment.

118. An elastomeric laminate, comprising:

a. an elastomeric film having a first major surface and a second major surface; and

b. a strand of an elastomeric material secured to the first major surface of the elastomeric film.

119. The elastomeric laminate according to Claim 118, wherein:

the elastomeric strand material comprises a thermoplastic polymer.

120. The elastomeric laminate according to Claim 118, wherein:
the elastomeric film material comprises a thermoplastic polymer.

121. The elastomeric laminate according to Claim 118, wherein:
the elastomeric strand material comprises a thermoset polymer.

122. The elastomeric laminate according to Claim 118, wherein:
the elastomeric film material comprises a thermoset polymer.

123. The elastomeric laminate according to Claim 118, wherein:
the elastomeric composition of the strand material is the same as the elastomeric composition of the film material.

124. The elastomeric laminate according to Claim 118, wherein:
the elastomeric composition of the strand material is different than the elastomeric composition of the film material.

125. The elastomeric laminate according to Claim 118, further comprising:
a facing sheet bonded to the laminate.

126. The elastomeric laminate according to Claim 125, wherein:
both major surfaces of the laminate are covered with facing sheets.

127. The elastomeric laminate according to Claim 125, wherein:
the facing sheet is a spunbond sheet.

128. The elastomeric laminate according to Claim 125, further comprising:
a garment incorporating the elastomeric laminate and the facing sheet into the structure of the garment.

129. The elastomeric laminate according to Claim 128 wherein the garment is one selected from the group of personal care garments, medical garments and industrial workwear garments.

130. The elastomeric laminate according to Claim 129 wherein the garment is one selected from the group of: diapers, training pants, swim wear, absorbent underpants, adult incontinence products, feminine hygiene products, protective medical gowns, surgical medical gowns, caps, gloves, drapes, face masks laboratory coats and coveralls.

131. The elastomeric laminate according to Claim 118, further comprising:
a garment incorporating the elastomeric laminate into the structure of the garment.

132. The elastomeric laminate according to Claim 118, wherein:
different portions of the elastomeric film exhibit different amounts of elastic tension.

133. The elastomeric laminate according to Claim 132, further comprising a plurality of elastomeric strands on the elastomeric film surface, wherein at least some of the elastomeric strands exhibit different amounts of elastic tension.

134. The elastomeric laminate according to Claim 118, wherein:
there are multiple elastomeric strands on the elastomeric film surface.

135. The elastomeric laminate according to Claim 134, wherein:
at least some of the elastomeric strands exhibit different amounts of elastic tension.

136. The elastomeric laminate according to Claim 134, wherein:
at least some of the elastomeric strands have different thicknesses.

137. The elastomeric laminate according to Claim 134, wherein:
at least some of the elastomeric strands have different compositions.

138. The elastomeric laminate according to Claim 134, wherein:
the elastomeric strands are arranged in periodic spacing.

139. The elastomeric laminate according to Claim 134, wherein:
the elastomeric strands are arranged in nonperiodic spacing.

140. The elastomeric laminate according to Claim 134, wherein:
the elastomeric strands are arranged in groups.

141. The elastomeric laminate according to Claim 140, wherein:
at least some of the groups exhibit different amounts of elastic tension from each other.

142. The elastomeric laminate according to Claim 140, wherein:
the groups have different spacing between their elastomeric strands.

143. The elastomeric laminate according to Claim 118, further comprising:
a second elastomeric strand secured to the second major surface of the elastomeric film.

144. The elastomeric laminate according to Claim 118, wherein:
a second elastomeric film contacts the elastomeric strand thereby placing the elastomeric strand between the elastomeric film and the second elastomeric film.

145. An elastomeric laminate, comprising:

a. an elastomeric film having a first major surface and a second major surface;

b. a plurality of strands of an elastomeric polymer material secured to the first major surface of the elastomeric film; and

c. a facing sheet bonded to at least one of the elastomeric film or the elastomeric strands.

146. A process of making an elastomeric laminate, comprising:

a. producing an elastomeric film;

b. producing elastomeric strands;

c. securing the elastomeric strands to the elastomeric film.

147. The process of making an elastomeric laminate according to Claim 146, further comprising: the step of producing elastomeric film including placing elastomeric material extruded from a slotted film die onto a cooling roll; and
stretching the elastomeric film from the cooling roll towards a nip formed between two nip rollers.

148. The process of making an elastomeric laminate according to Claim 147, further comprising: adding a tackifier to a formulation of the film.

149. The process of making an elastomeric laminate according to Claim 147, further comprising: the step of producing elastomeric strands including placing elastomeric material extruded from a filament die onto a cooling roll; and
stretching the elastomeric strands from a cooling roll towards the nip formed between two nip rollers.

150. The process of making an elastomeric laminate according to Claim 149, further comprising: securing the elastomeric film and the elastomeric strands together in the nip.

151. A garment having an elastomeric laminate therein which is made by the process of Claim 150.

152. The process of making an elastomeric laminate according to Claim 146, further comprising: the step of producing elastomeric strands including placing elastomeric material extruded from a filament die onto a cooling roll; and stretching the elastomeric strands from a cooling roll towards a nip formed between two nip rollers.

153. The process of making an elastomeric laminate according to Claim 152, further comprising: adding a tackifier to a formulation of the strands.

154. The process of making an elastomeric laminate according to Claim 152 further including vertically stretching the elastomeric strands.

155. A garment having an elastomeric laminate therein which is made by the process of Claim 152.

156. The process of making an elastomeric laminate according to Claim 146, further comprising: spraying at least one of the film and strands with an adhesive before securement of the film and strands together.

157. The process of making an elastomeric laminate according to Claim 146, wherein the film is extruded onto a first cooling roll and the strands are extruded onto a second cooling roll.

158. The process of making an elastomeric laminate according to Claim 146, further including the step of keeping the laminate under tension with a pair of opposed tensioning rollers after it passes through the nip.

159. The process of making an elastomeric laminate according to Claim 158 including relaxing the laminate after passage through the opposed tensioning rollers.

160. A garment having an elastomeric laminate therein which is made by the process of Claim 158.

161. The process of making an elastomeric laminate according to Claim 146, further including the step of adhering a facing sheet to one side of the laminate.

162. The process of making an elastomeric laminate according to Claim 161, further including the step of adhering facing sheets onto both sides of the laminate.

163. The process of making an elastomeric laminate according to Claim 161, further including the step of adhering the facing sheet to the laminate in the nip.

164. The process of making an elastomeric laminate according to Claim 146, wherein at least one of the elastomeric film and the elastomeric strands is a thermoset polymer that is cross-linked prior to securing the elastomeric strands to the elastomeric film.

165. The process of making an elastomeric laminate according to Claim 146, wherein at least one of the elastomeric film and the elastomeric strands can be cross-linked after securing the elastomeric strands to the elastomeric film.

166. A garment having an elastomeric laminate therein which is made by the process of Claim 146.

167. A process of making an elastomeric laminate, comprising:

a. extruding an elastomeric film onto a first cooling roll;

b. extruding elastomeric strands onto a second cooling roll;

c. feeding the elastomeric film and elastomeric strands from the first and second cooling rolls into a roller nip and securing the elastomeric strands to the elastomeric film;

d. adhering a facing sheet to at least one of the elastomeric film and elastomeric strands in the roller nip.

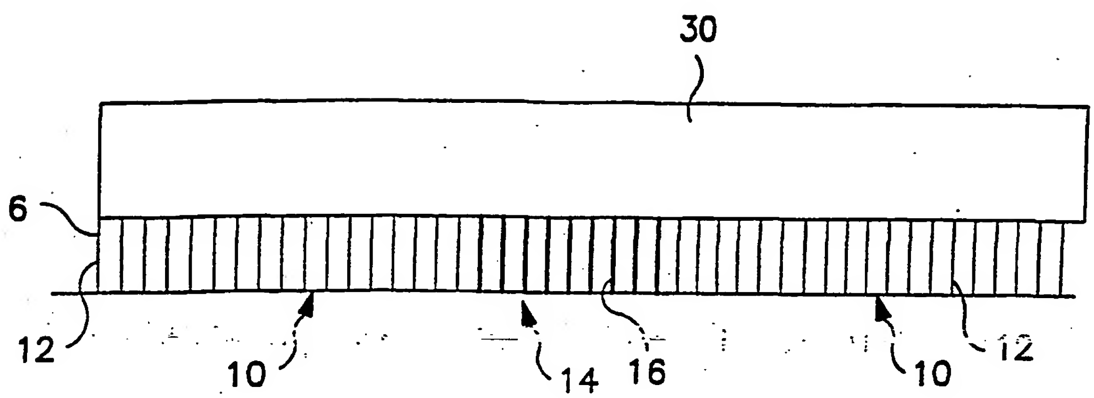


FIG. 1

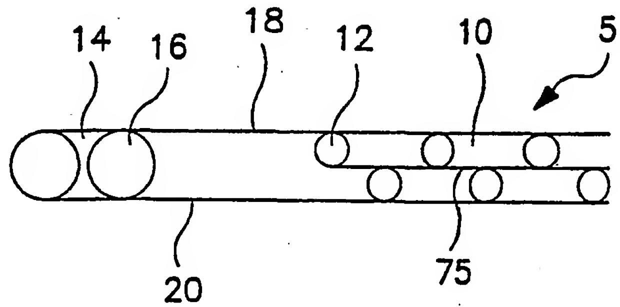


FIG. 2

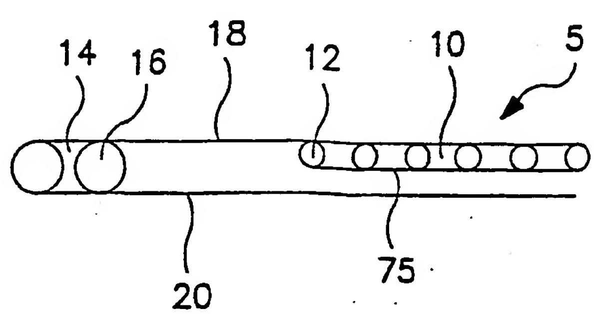


FIG. 3

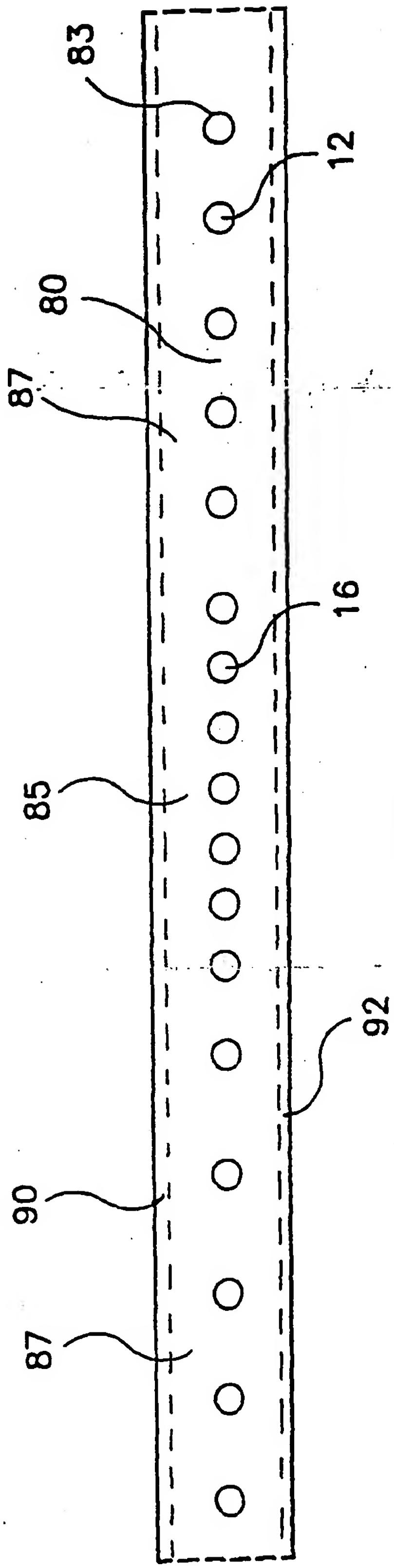


FIG. 4

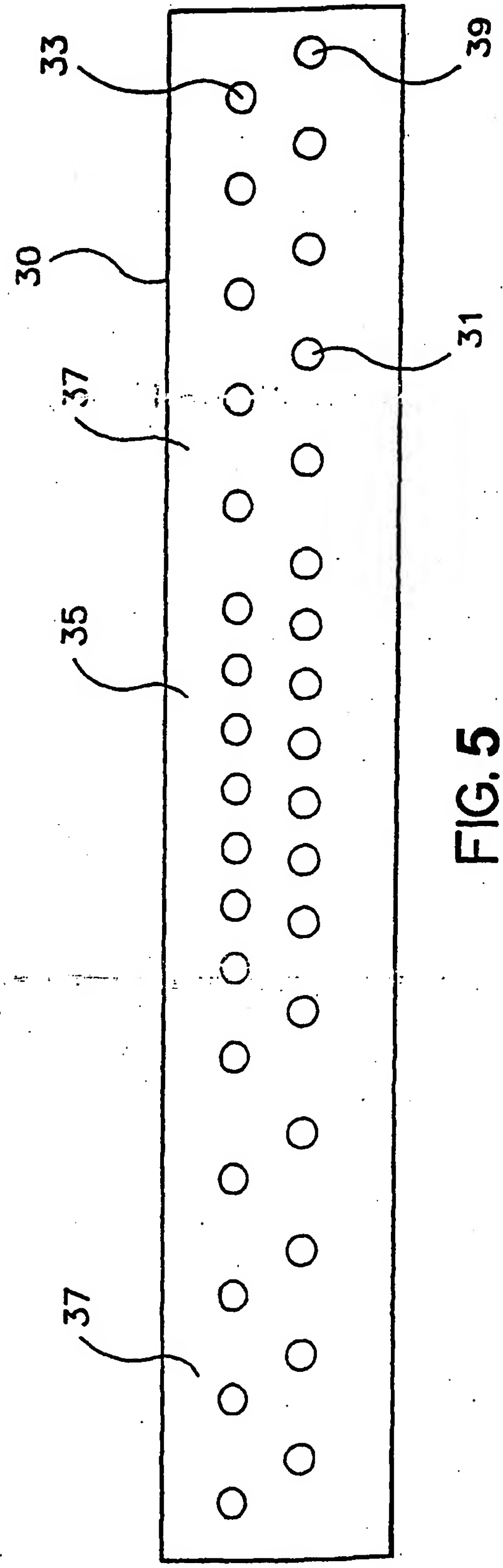


FIG. 5

FIG. 6

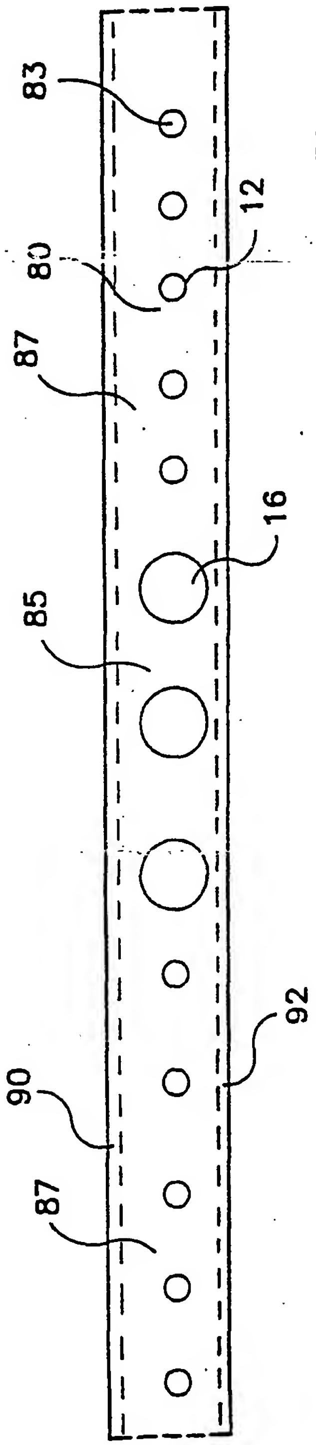


FIG. 7

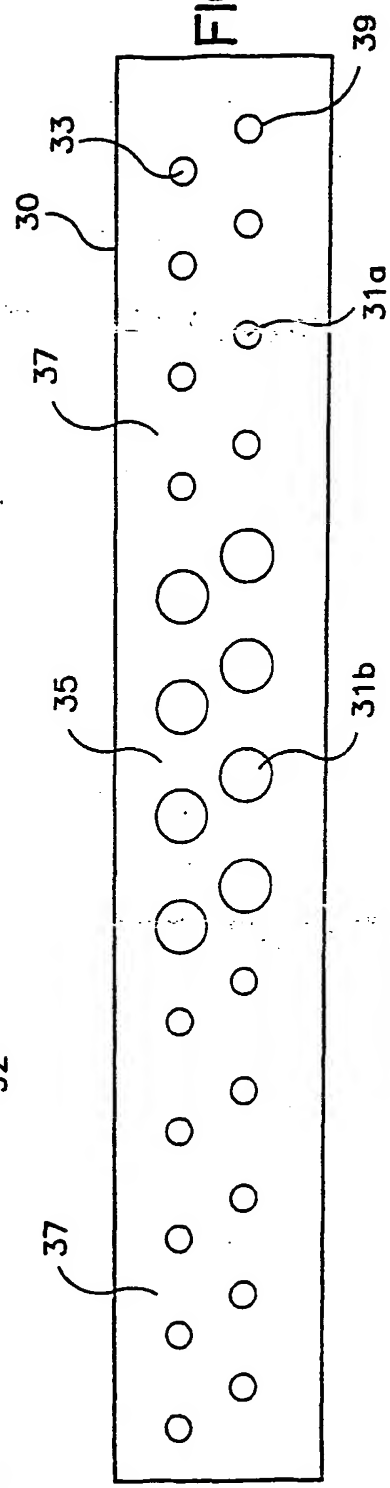
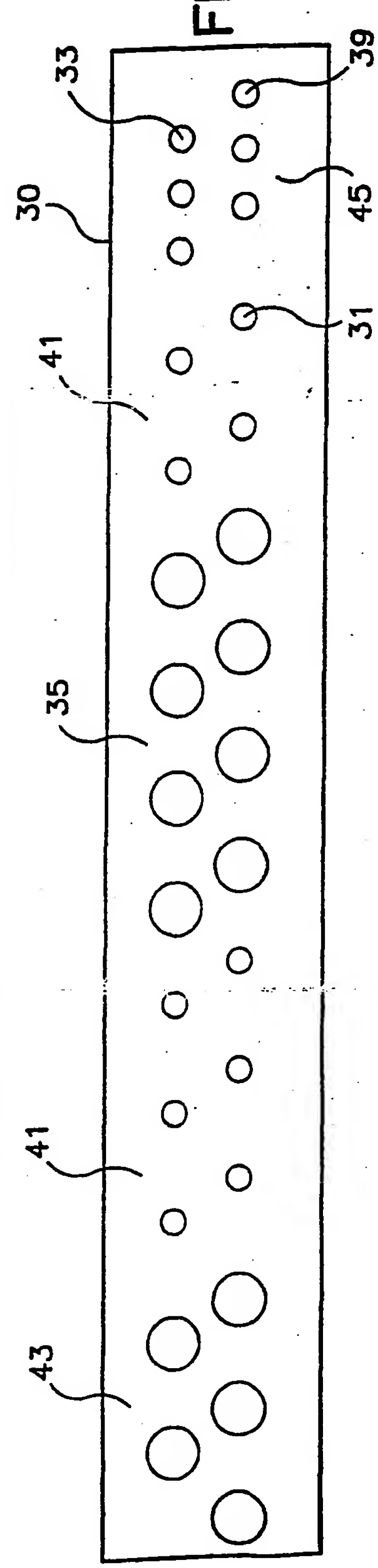


FIG. 8



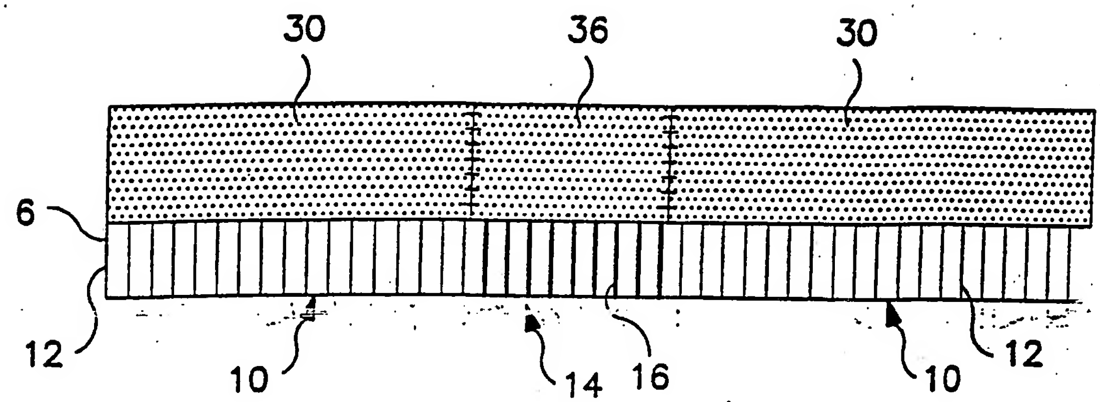


FIG. 9

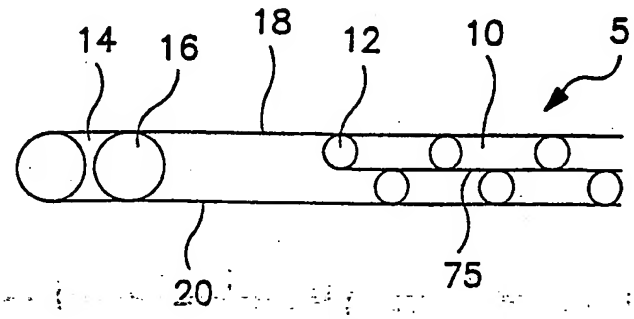


FIG. 10

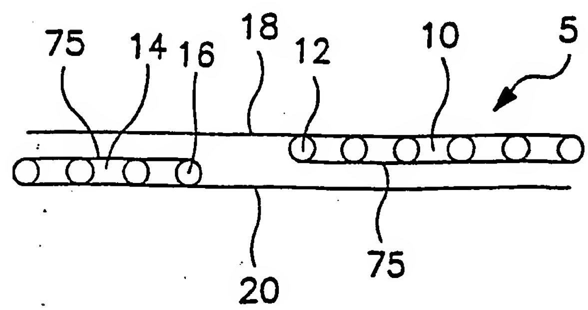


FIG. 11

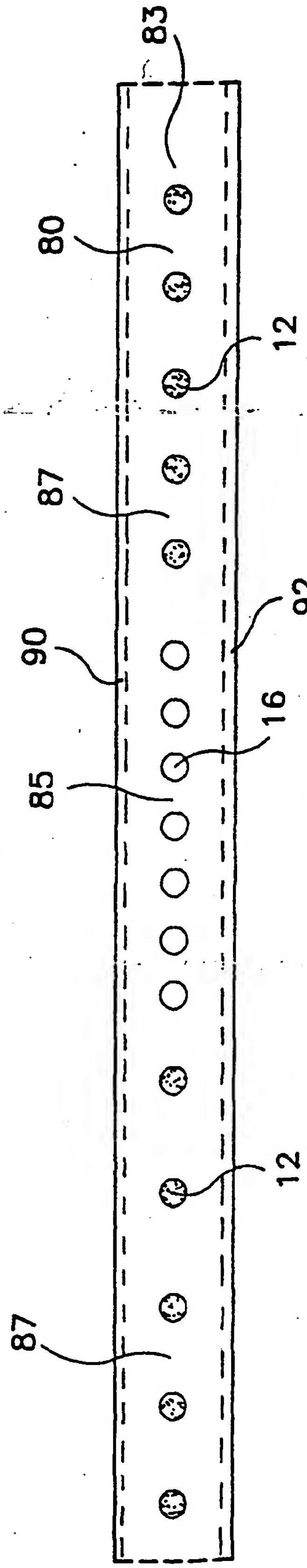


FIG. 12

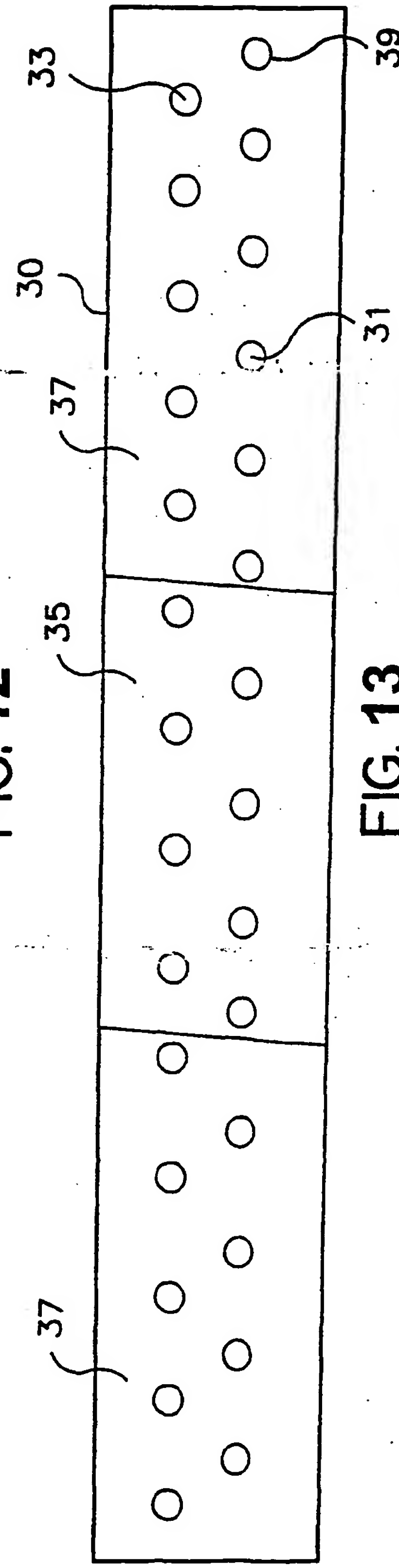


FIG. 13

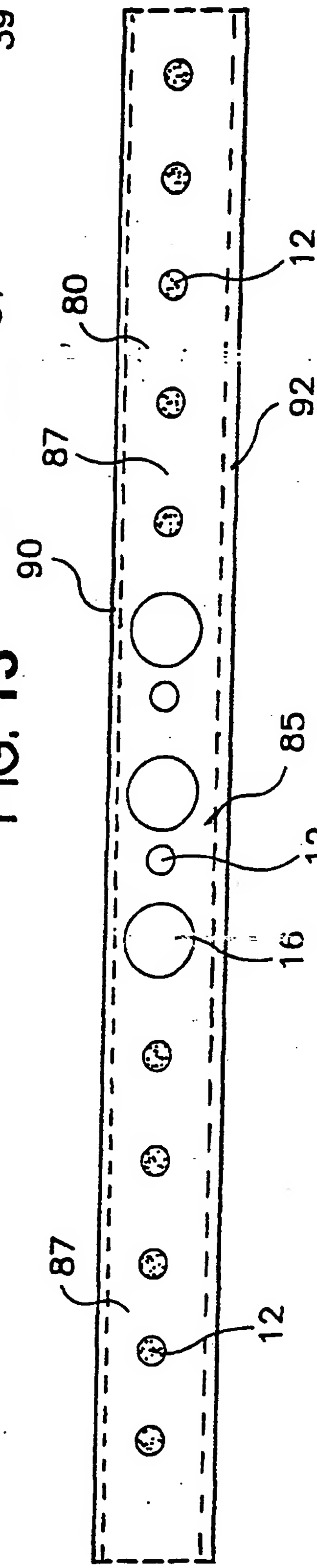


FIG. 14

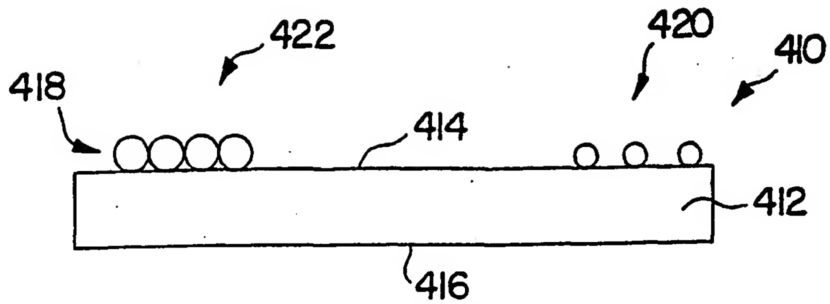
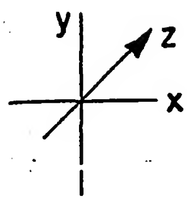


FIG.15



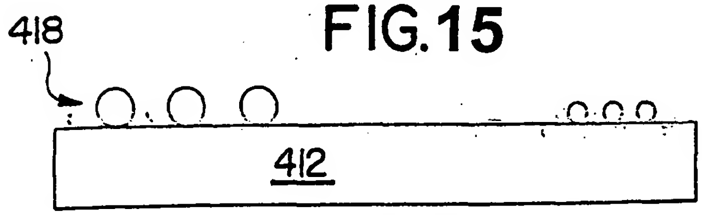


FIG.16

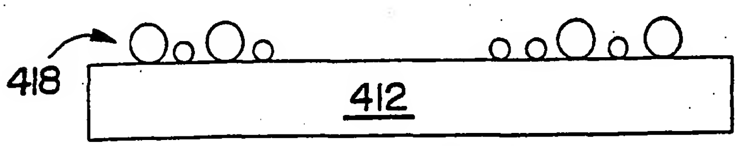


FIG.17

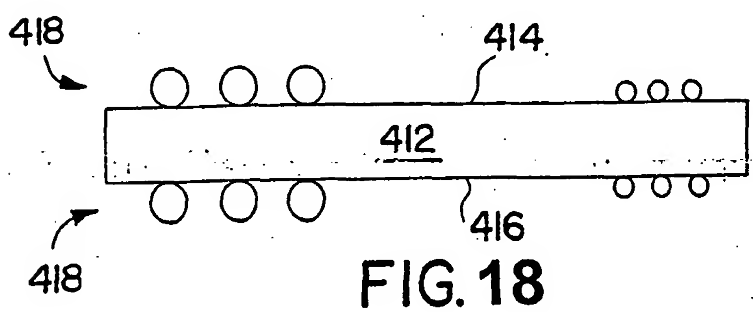


FIG.18

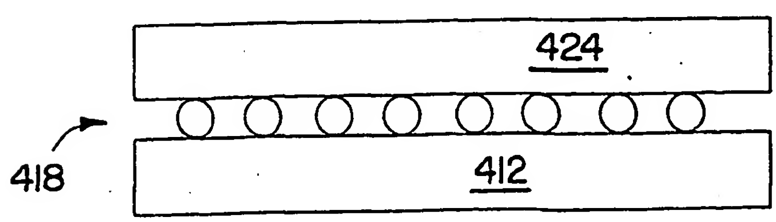


FIG. 19

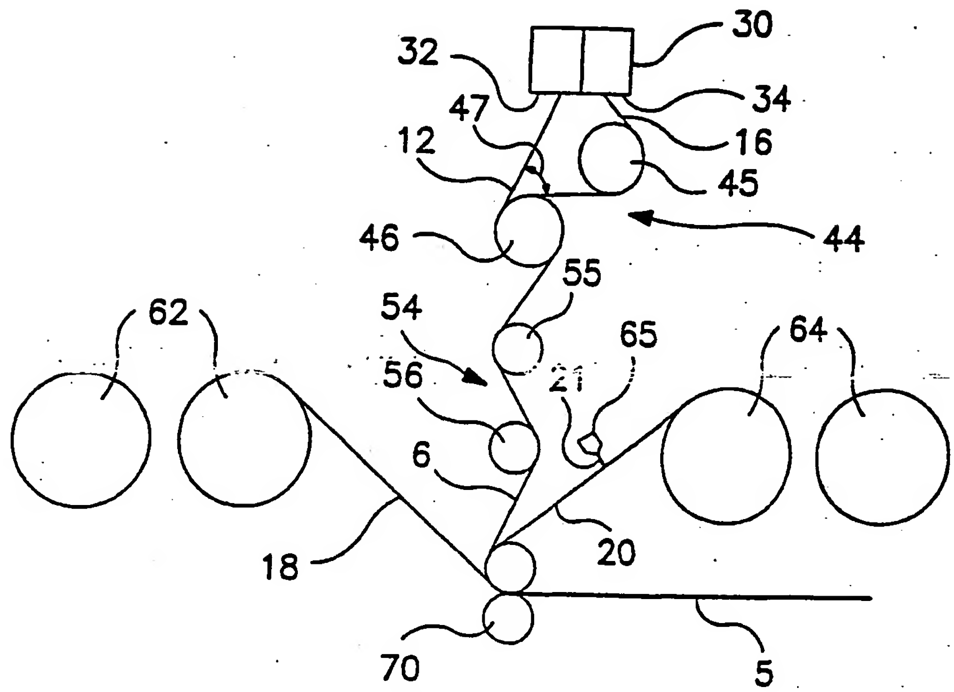

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FIG. 20

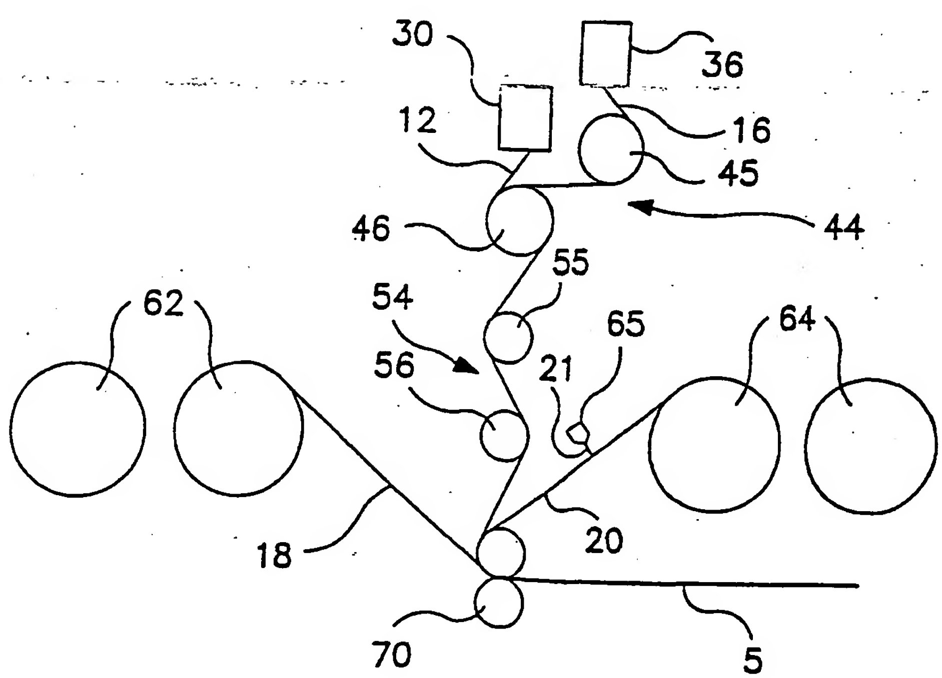
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FIG. 21

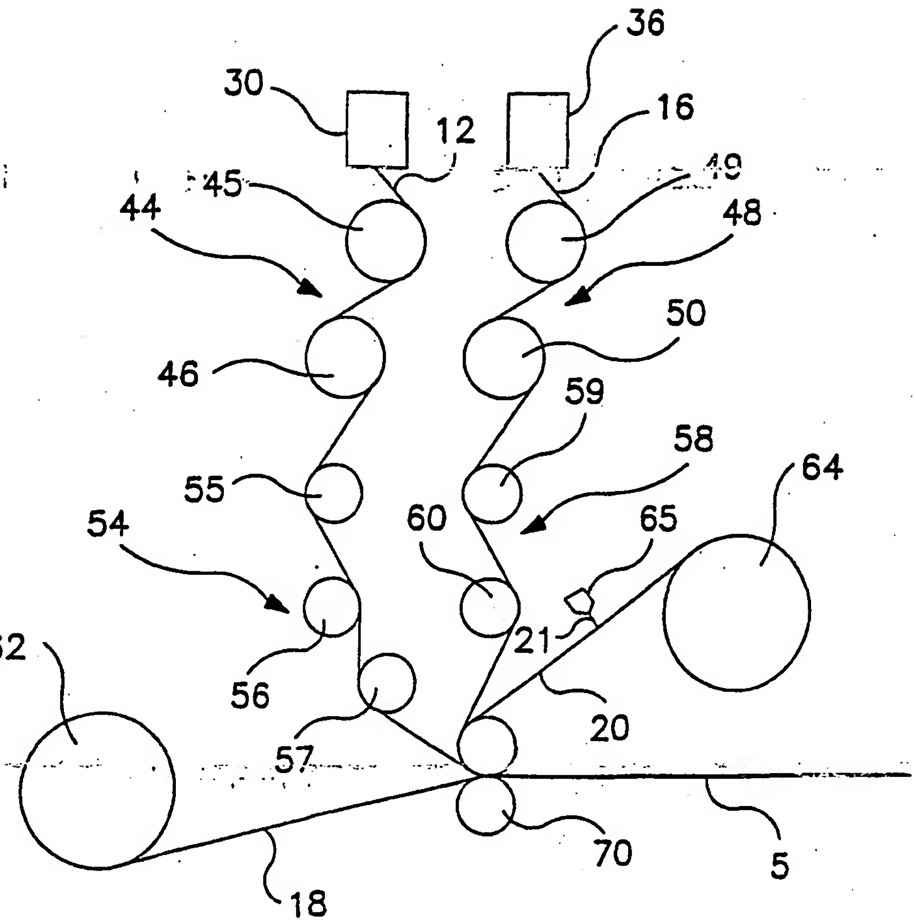

FIG. 22

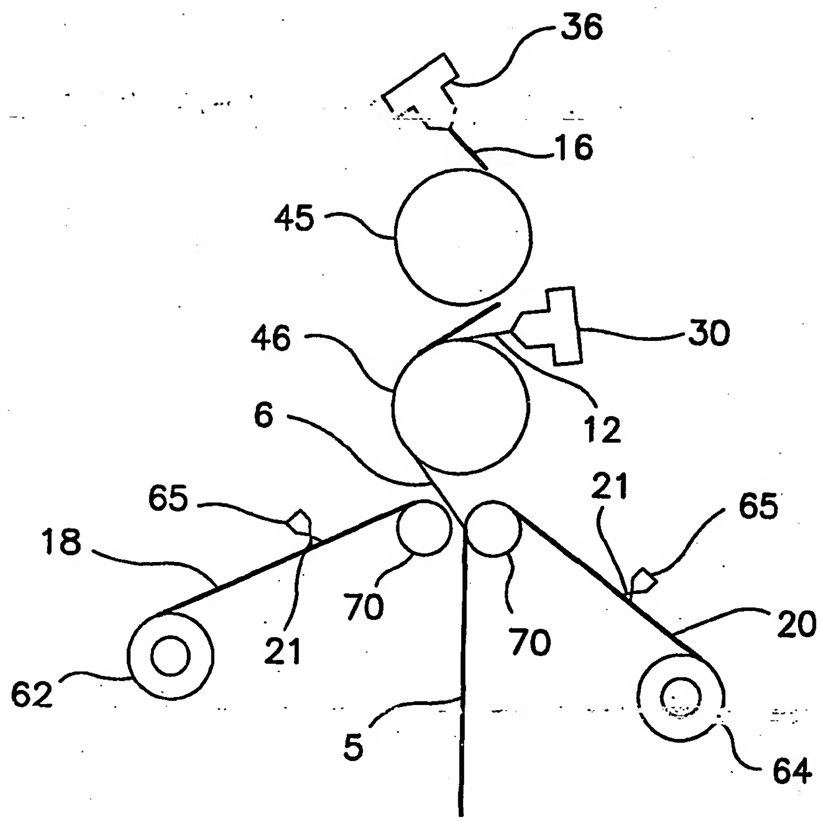

FIG. 23

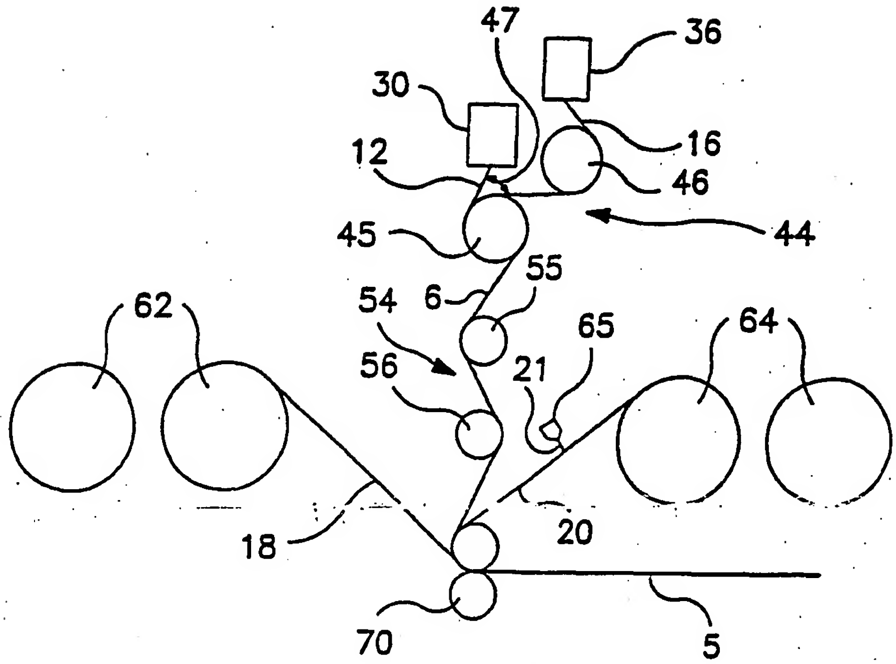
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FIG. 24

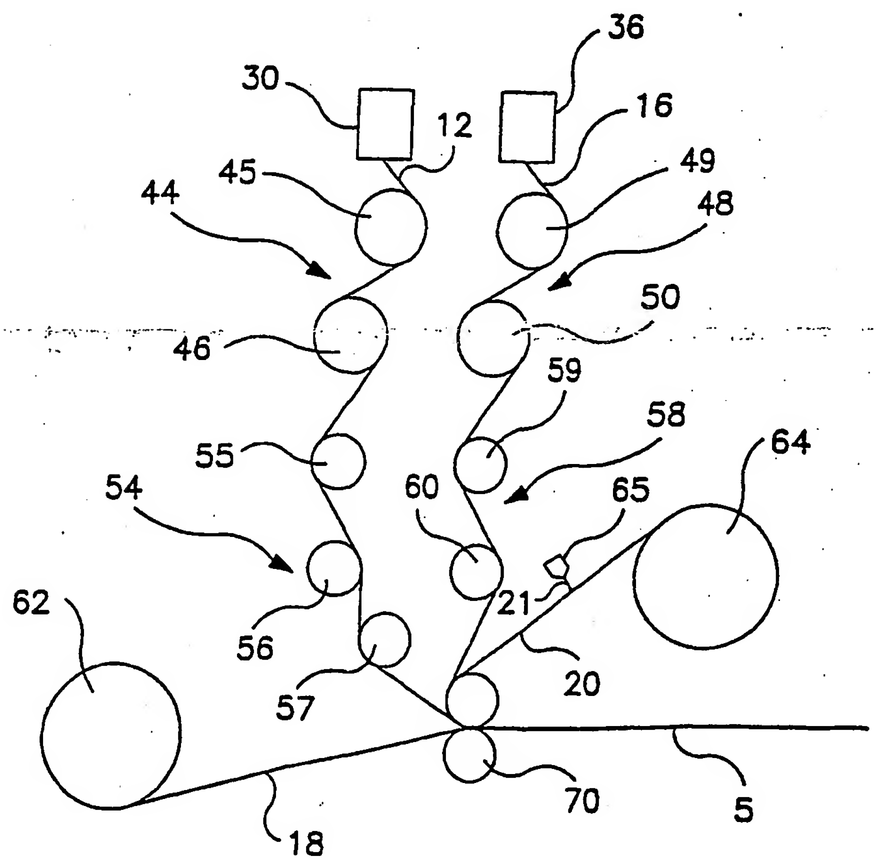
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FIG. 25

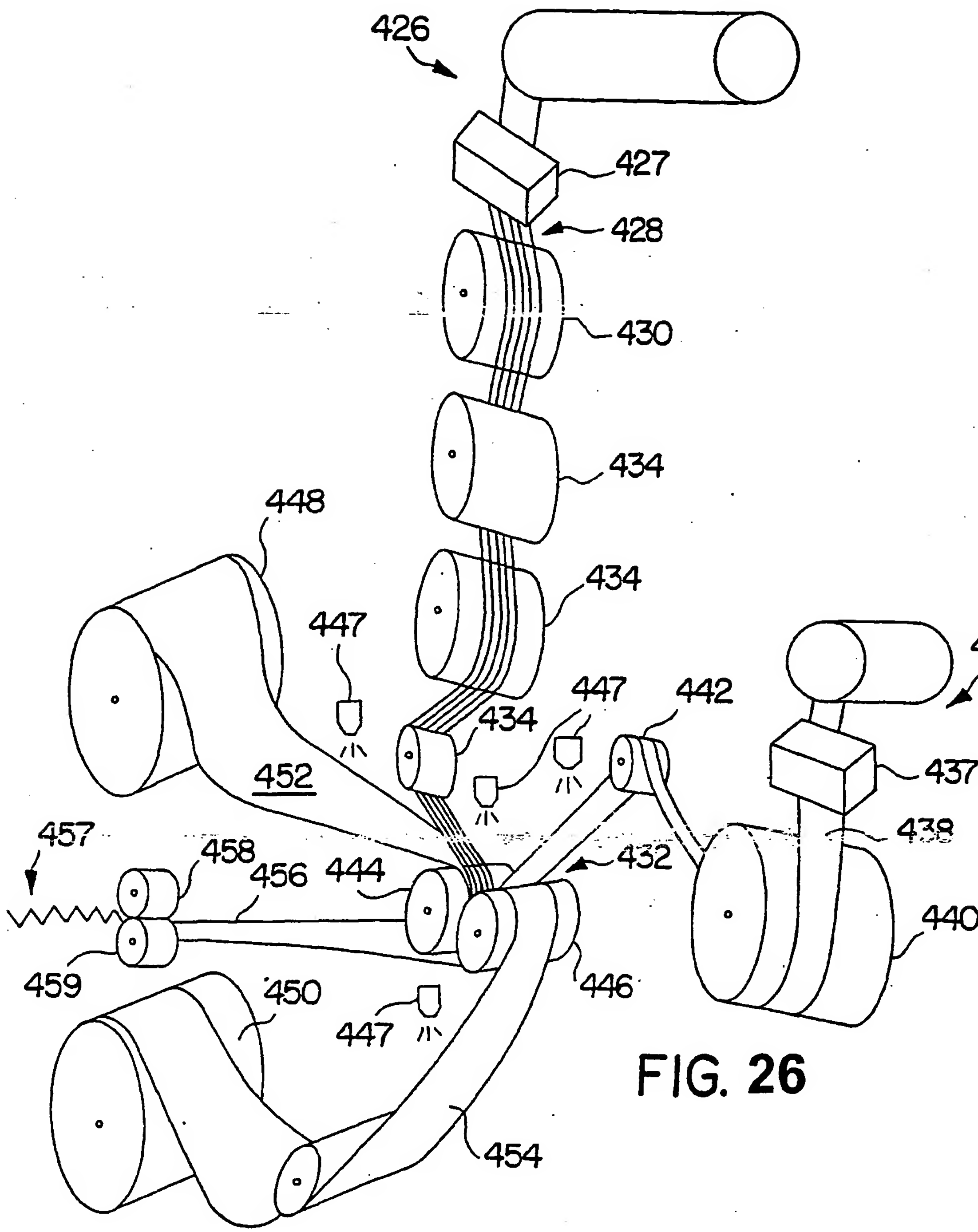
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FIG. 26

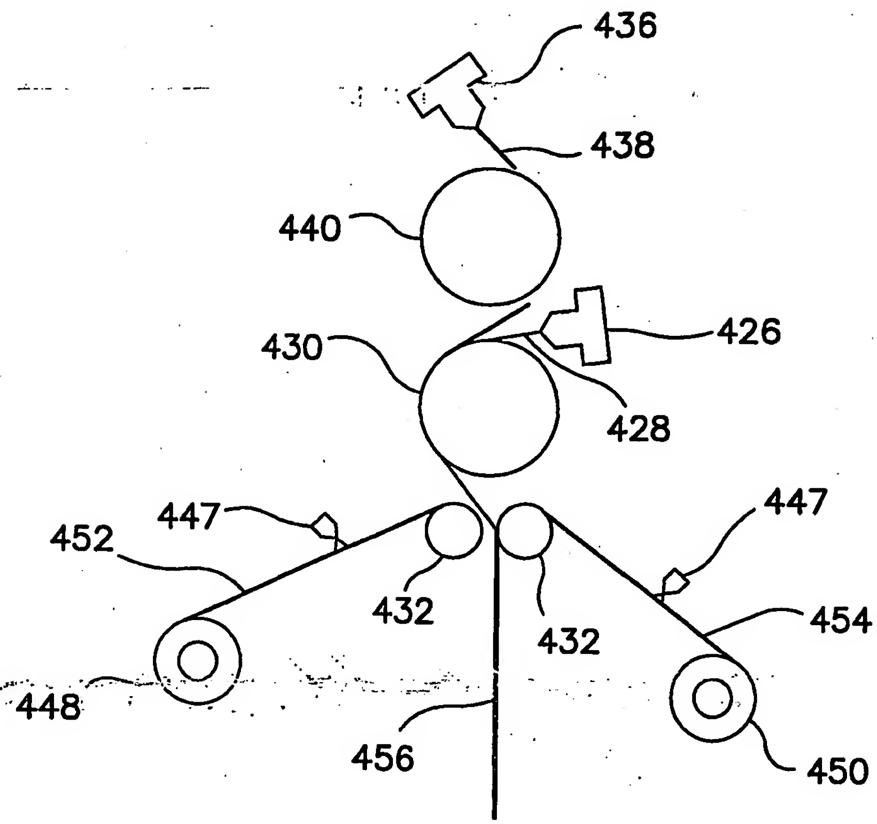


FIG. 27

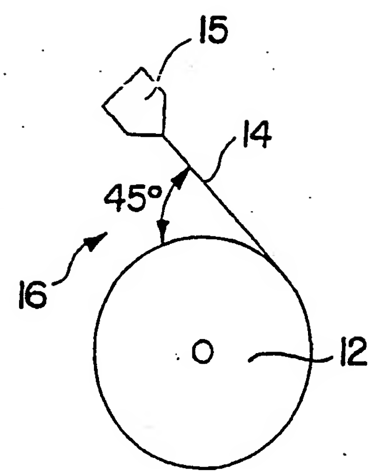
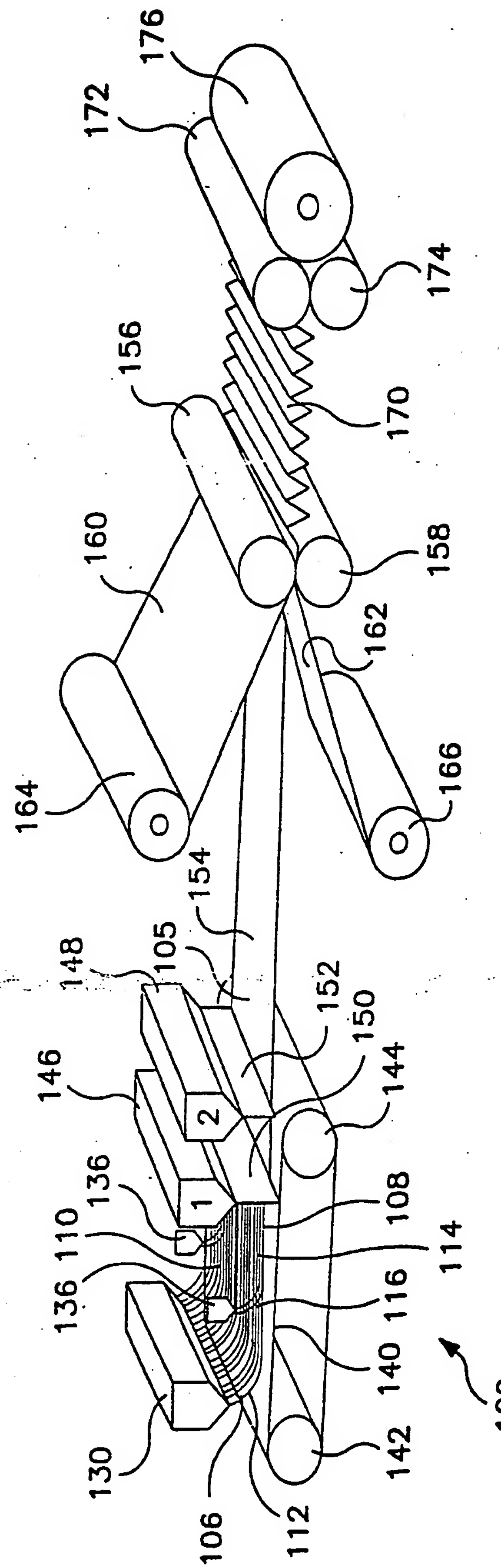


FIG. 28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170
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162
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166
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148
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114
116
140
130
142
100
106
112
1
2

FIG. 29

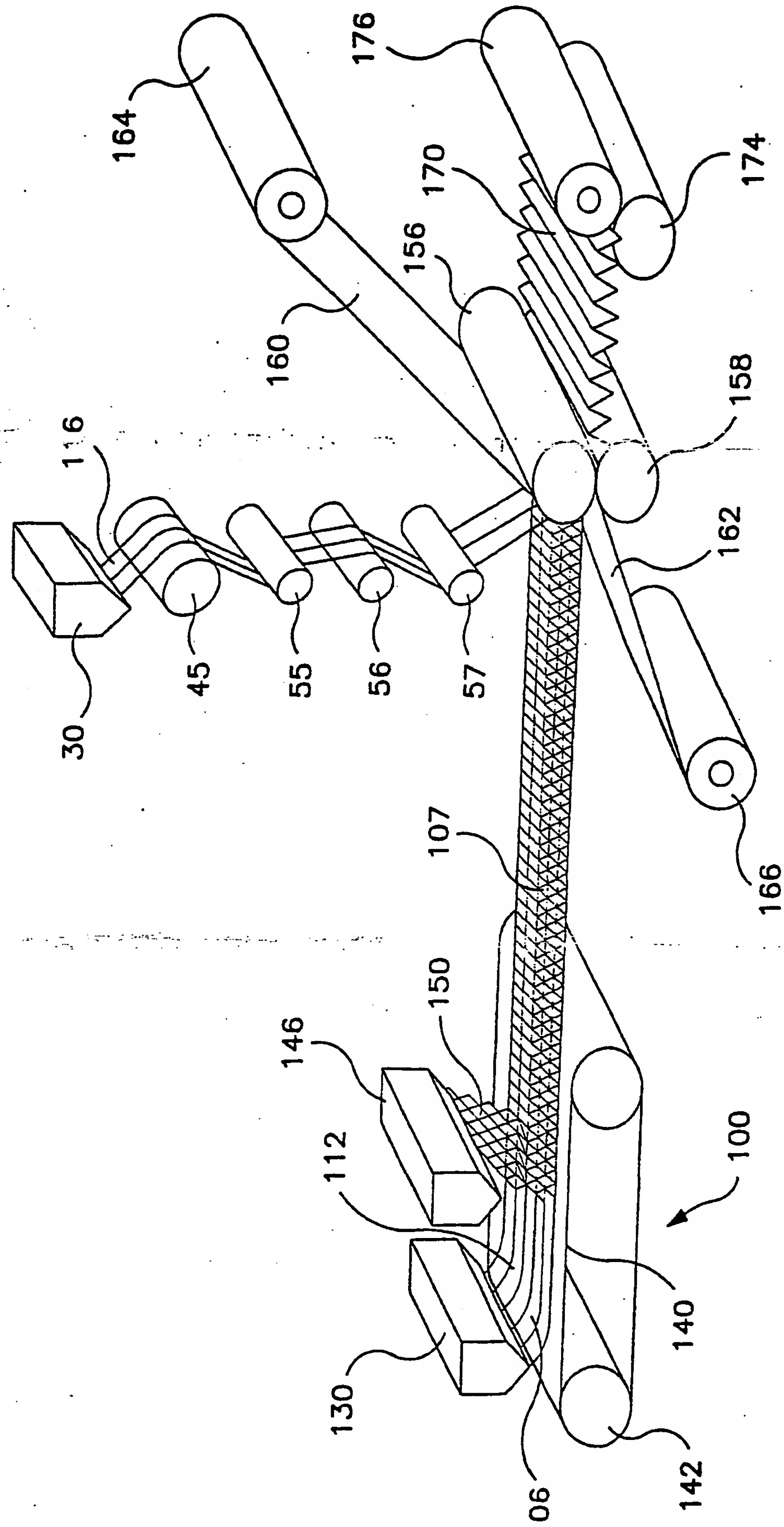
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FIG. 30

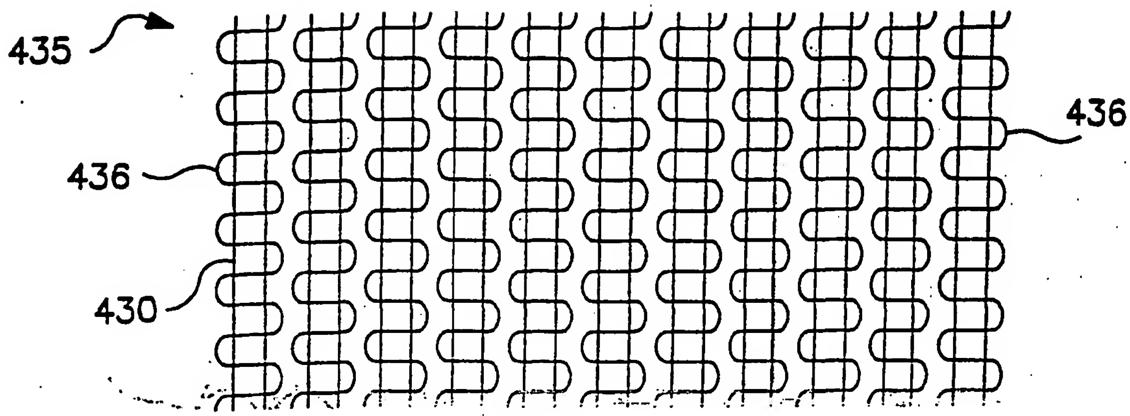


FIG. 31

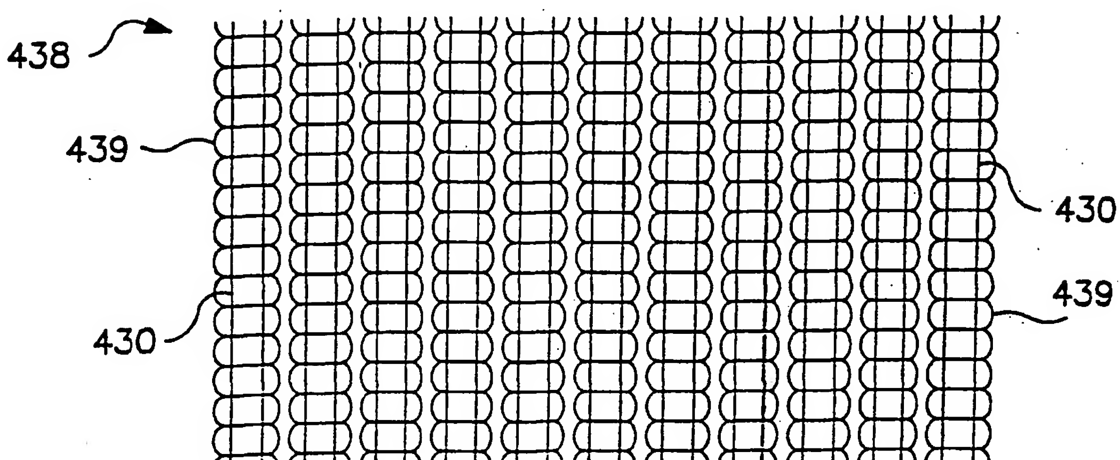


FIG. 32

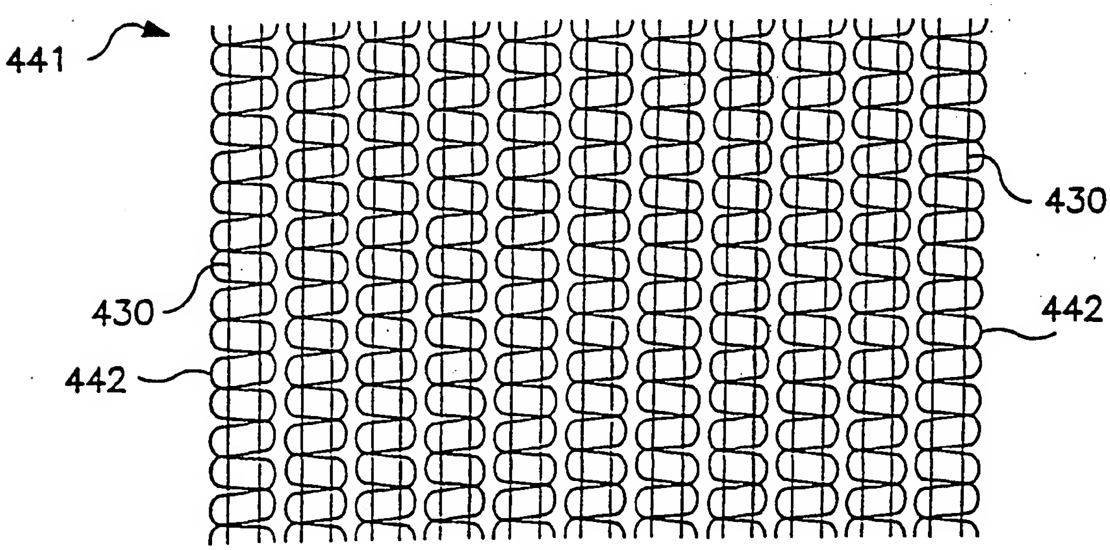


FIG. 33

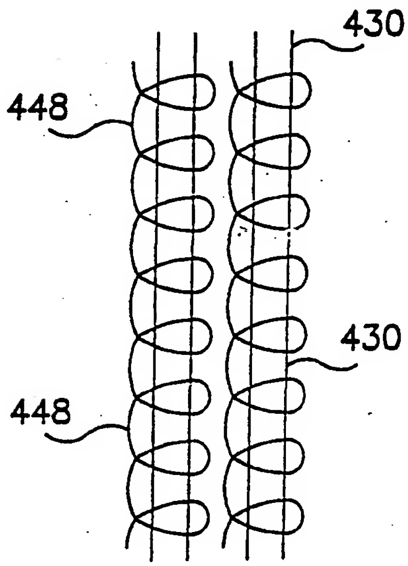


FIG. 34

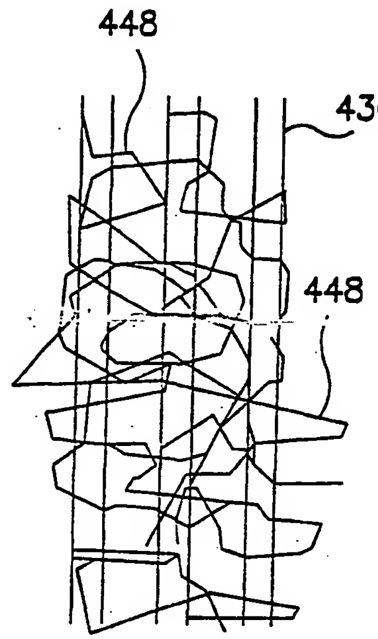


FIG. 35

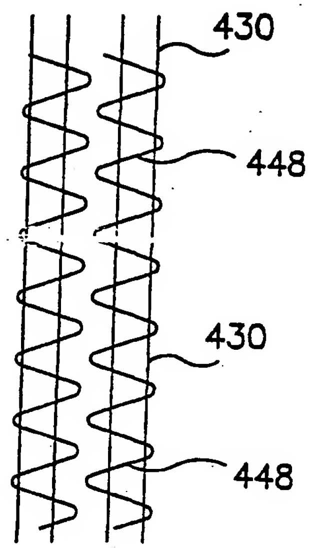


FIG. 36

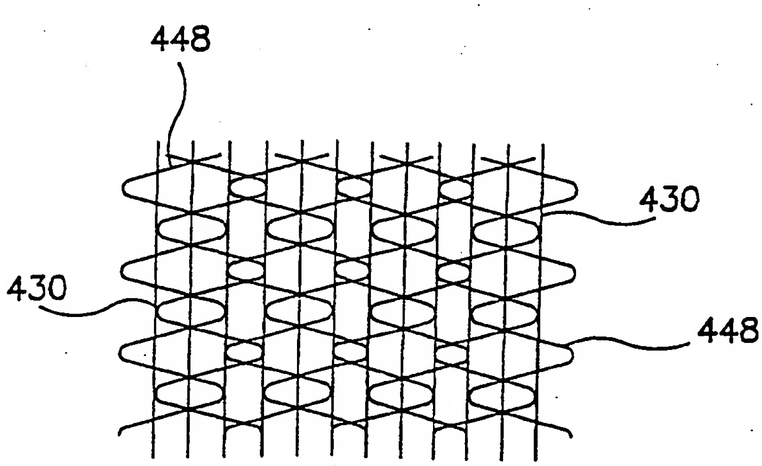


FIG. 37

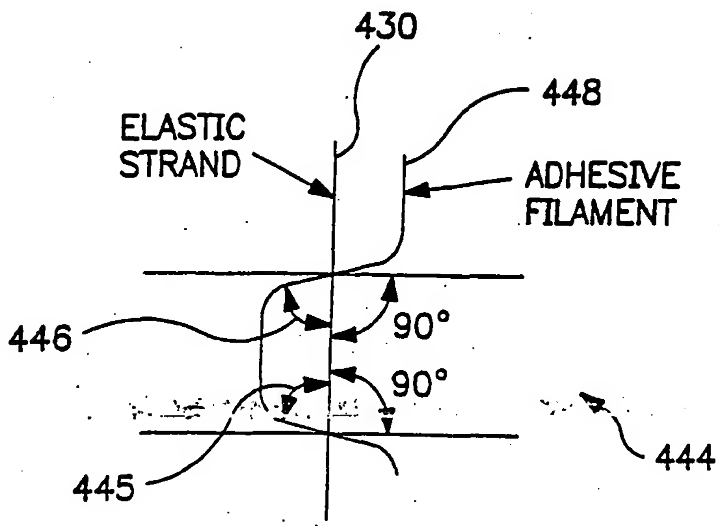

430
448
ELASTIC
STRAND
ADHESIVE
FILAMENT
446
90°
90°
444
445

FIG. 38

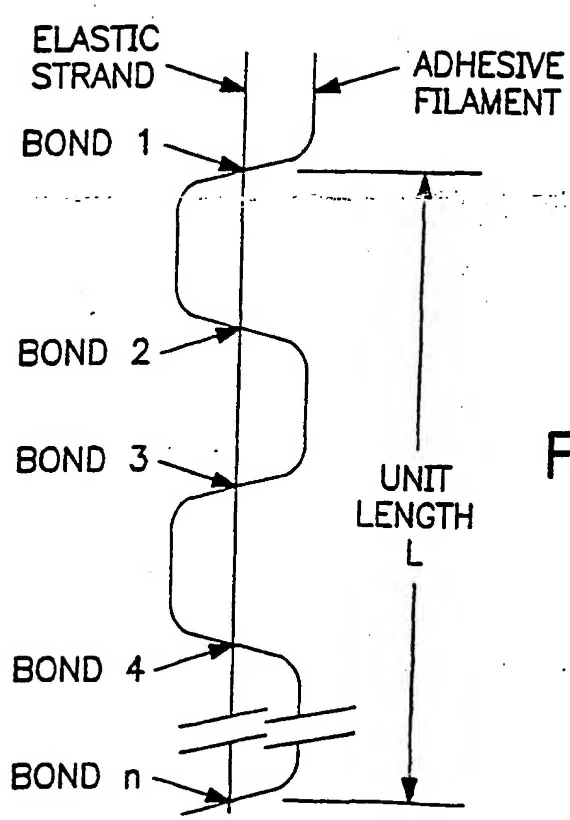

ELASTIC
STRAND
ADHESIVE
FILAMENT
BOND 1
BOND 2
BOND 3
BOND 4
BOND n
UNIT
LENGTH
L

FIG. 39

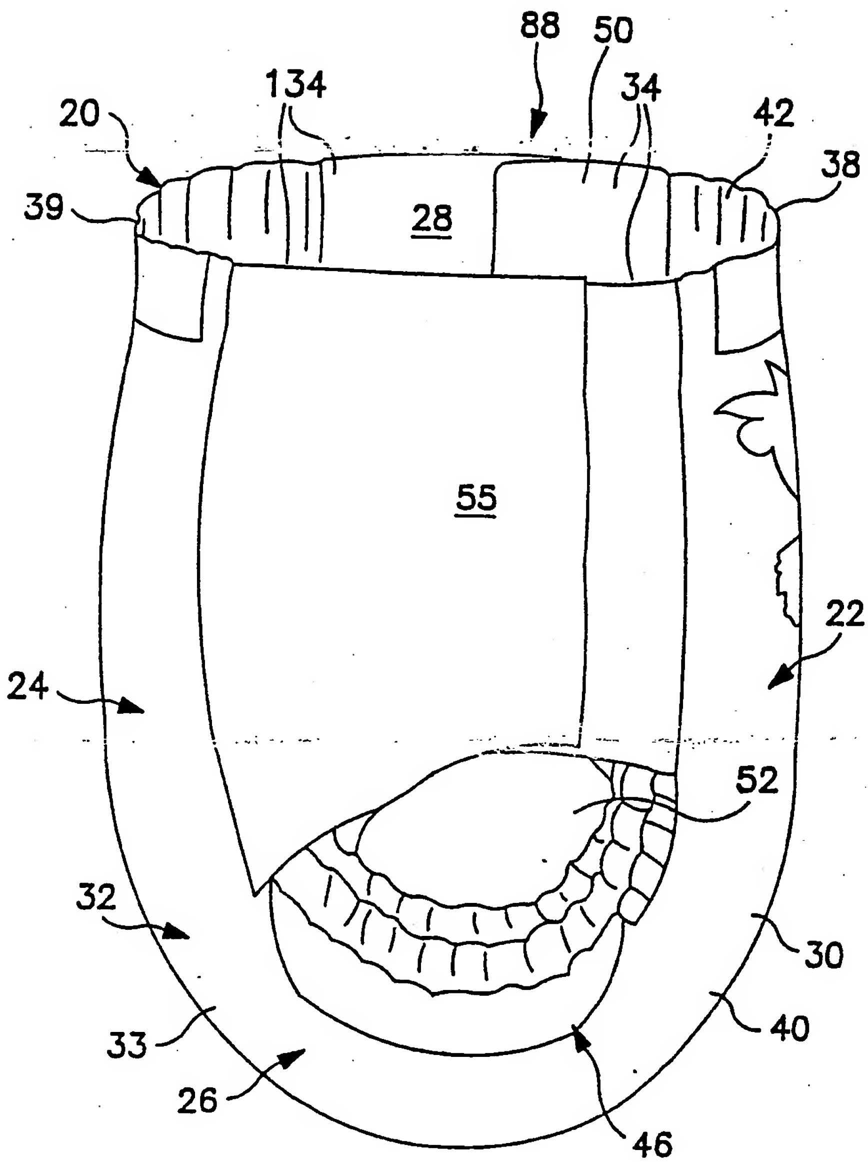
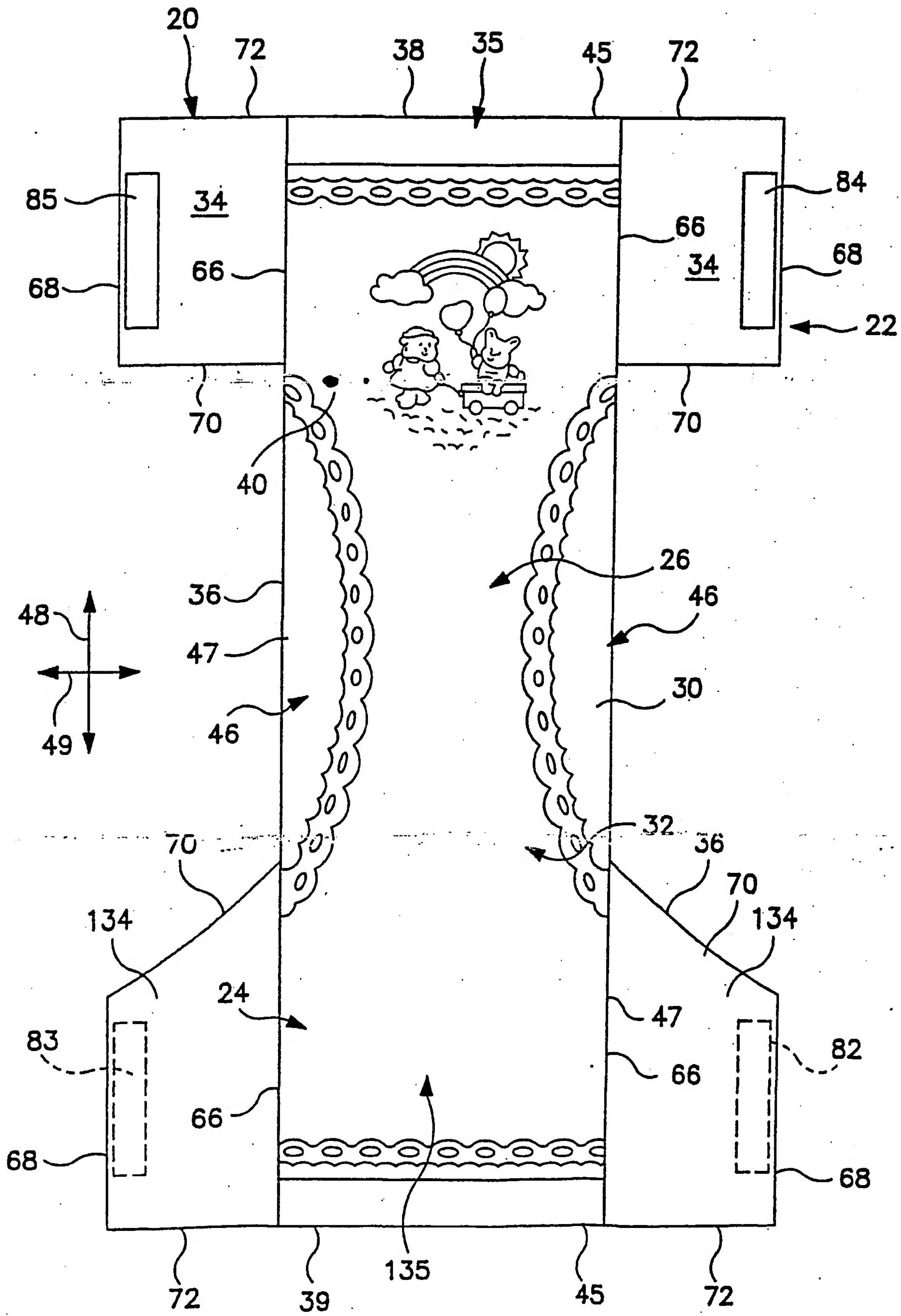


FIG. 40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72
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FIG. 41

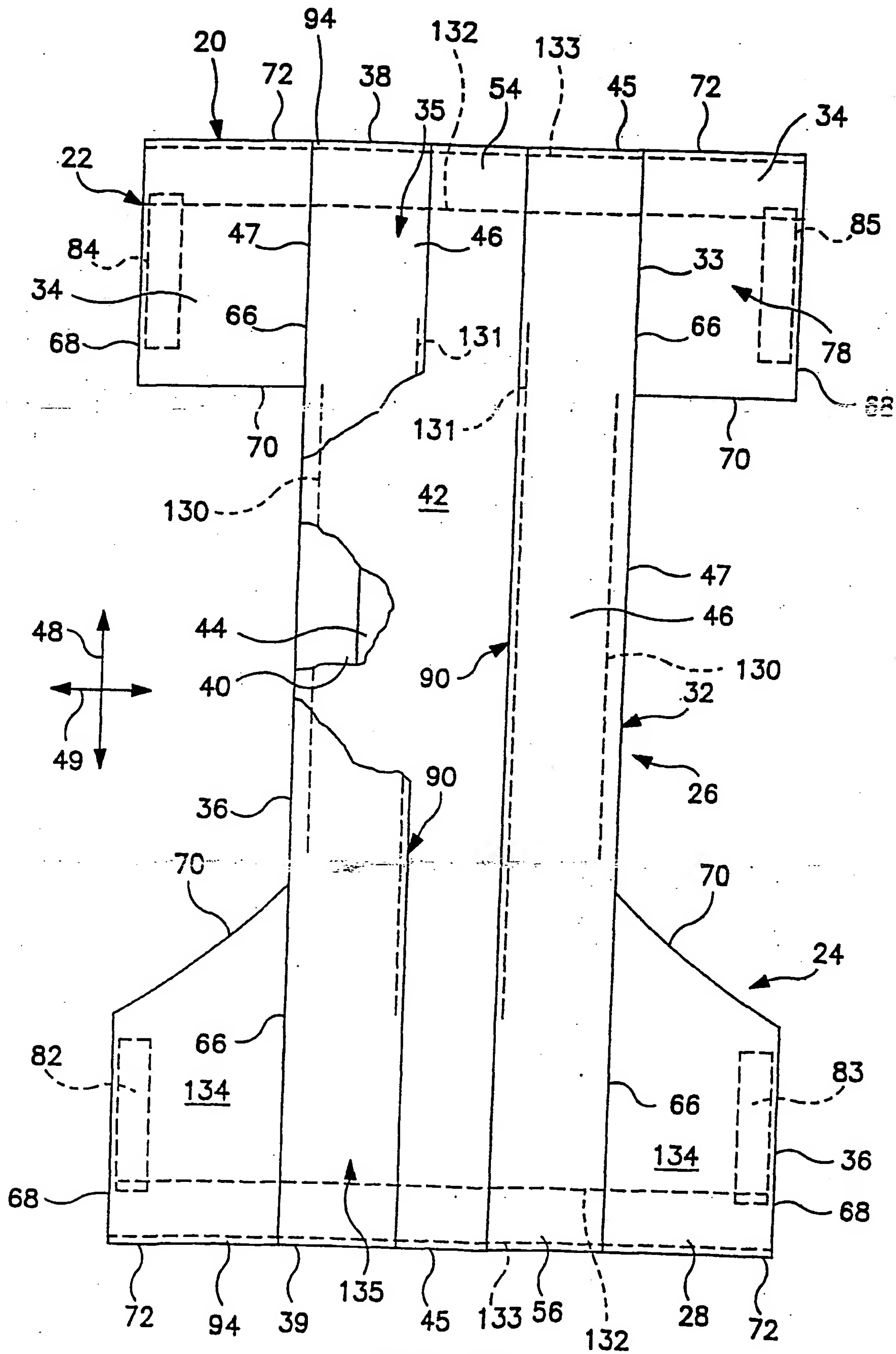
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FIG. 42

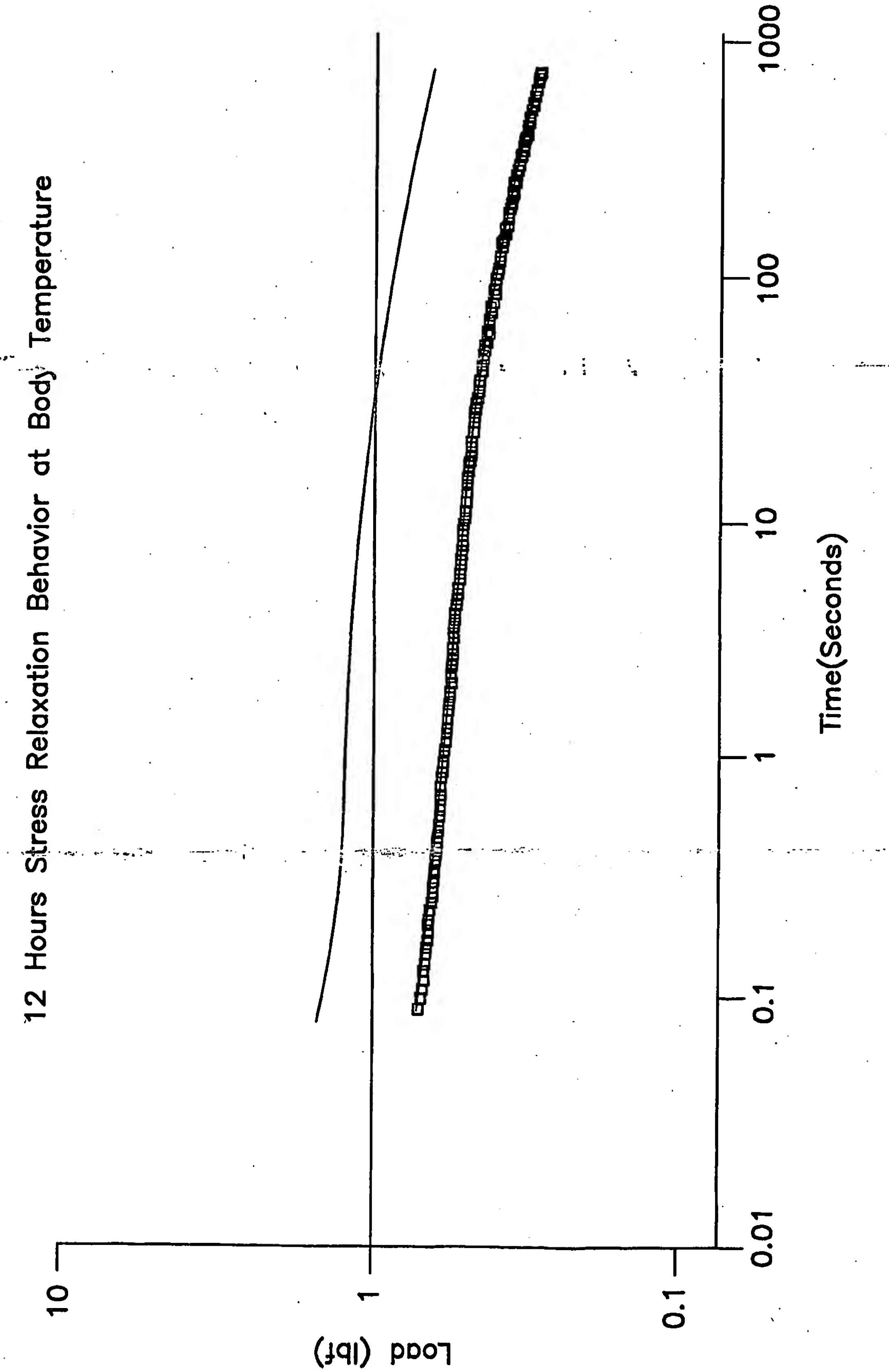
12 Hours Stress Relaxation Behavior at Body Temperature
10
1
0.1
Load (lbf)
0.01
0.1
1
10
100
1000
Time(Seconds)

FIG. 43

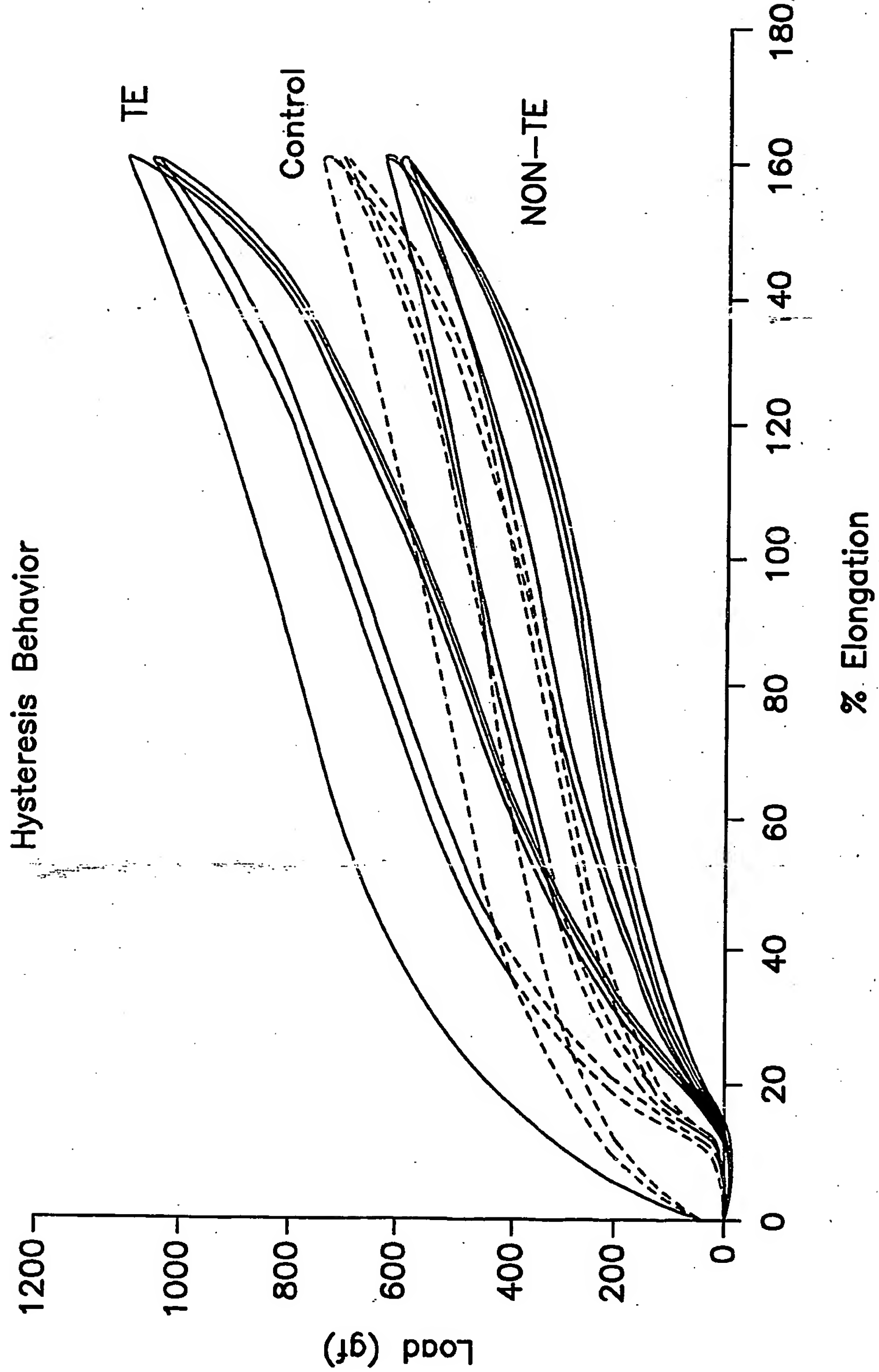
Hysteresis Behavior
TE
Control
NON-TE
Load (gf)
1200
1000
800
600
400
200
0
0
20
40
60
80
100
120
140
160
180
% Elongation

FIG. 44

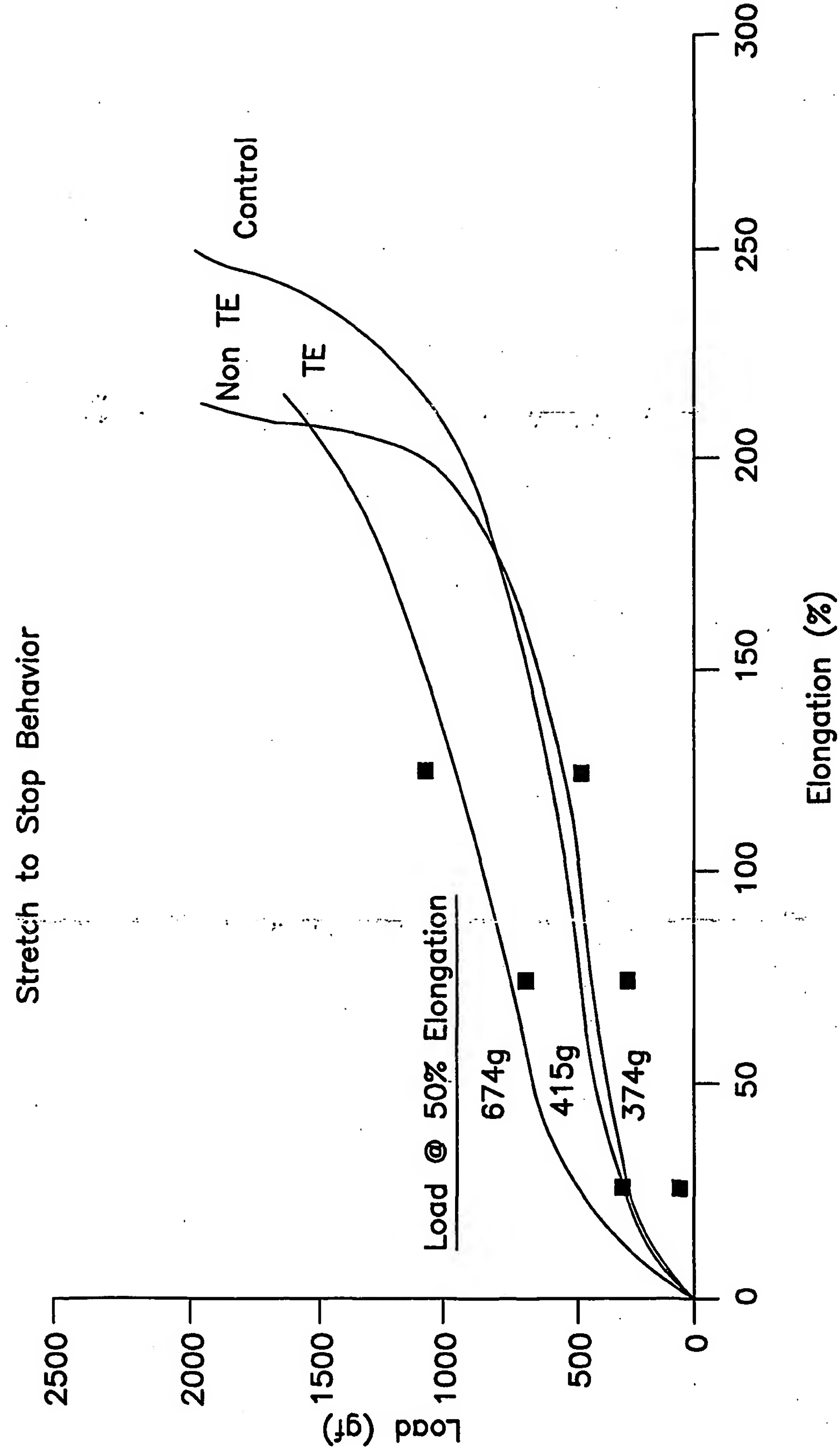
Stretch to Stop Behavior
Load @ 50% Elongation
674g
415g
374g
Control
Non TE
TE
Load (gf)
2500
2000
1500
1000
500
0
Elongation (%)
0
50
100
150
200
250
300

FIG. 45

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 November 2001 (22.11.2001)

PCT

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(21) International Application Number: PCT/US01/15580

(22) International Filing Date: 15 May 2001 (15.05.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

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60/204,321	15 May 2000 (15.05.2000)	US
60/204,323	15 May 2000 (15.05.2000)	US
09/855,188	14 May 2001 (14.05.2001)	US
09/855,189	14 May 2001 (14.05.2001)	US
09/855,194	14 May 2001 (14.05.2001)	US

(71) Applicant: KIMBERLY-CLARK WORLDWIDE, INC. [US/US]; 401 North Lake Street, Neenah, WI 54956 (US).

(72) Inventors: MAY, Raymond, Jeffrey; 3756 Meadow Creek Drive, Norcross, GA 30092 (US). CARR, James, Marcus; 802 Metoxen Avenue, Kaukauna, WI 54130 (US). BRUNNER, Michael, Scott; 310 Arbor Creek Trail, Roswell, GA 30076 (US). BOGGS, Lavada, Campbell; 2639 Spencer Trace NE, Marietta, GA 30062 (US). RHIM, Hannong; 2648 Long Lake Drive, Roswell, GA 30075 (US). FITTS, James, Russell, Jr.; 8070 Bailey Mill Road, Gainesville, GA 30506 (US). THIESSEN, Richard, Harry; 1801 McIntosh Drive, Appleton, WI 54914 (US). SALTER, Kenneth, Michael; 106 Wilson Creek Drive, LaGrange, GA 30240 (US). LANG, Victor, Charles; 3559 Grand Meadows Drive, Appleton, WI 54914 (US). EGGEN, Adrian, Roy; 906 East Franklin Street, Appleton, WI 54911 (US). THOMAS, Oomman, Painumoottil; 280 Relais Trace, Alpharetta, GA 30004 (US).

(74) Agents: RAUCH, Melanie, I.; Pauley Petersen Kinne & Fejer, Suite 365, 2800 West Higgins Road, Hoffman Estates, IL 60195 et al. (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

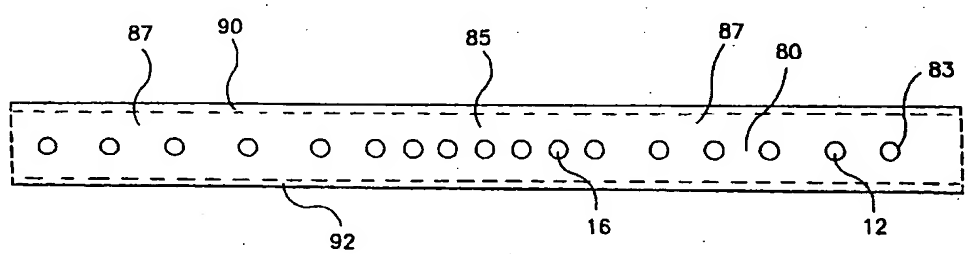
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report: 22 August 2002

[Continued on next page]

(54) Title: TARGETED ELASTIC LAMINATE



(57) Abstract: A targeted elastic laminate material having different zones of tension across a width of a material roll and methods for making the same. In one embodiment, the targeted elastic laminate material has at least one low tension zone with first filaments having a first basis weight and at least one high tension zone having second filaments with a second basis weight greater than the first basis weight. The second basis weight is greater due to increased average thickness of the second filaments and/or increased frequency of second filaments relative to the first filaments. In another embodiment, at least two polymers or polymer blends having different set properties are used to produce varying tension zones across the material. In yet another embodiment, the targeted elastic laminate material includes an elastic film with elastic strands placed thereon. The targeted elastic laminate material has elastic properties that provide improved fit characteristics to disposable personal care products.

WO 01/087588 A3

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/15580

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B32B5/04 B32B5/08 B32B5/14 B32B5/26 A61F13/15
B32B31/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B32B A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 34264 A (MINNESOTA MINING & MFG) 21 December 1995 (1995-12-21)	1-24, 49-58
Y	page 4, line 14 -page 5, line 3; claims; figures	25,28, 29,36, 38,48
	page 6, line 7 - line 19 page 11, line 19 - line 31	
A	page 17, paragraph 1	25,30, 31,36

X	US 4 300 562 A (PIENIAK HEINZ A) 17 November 1981 (1981-11-17) the whole document	1-26,29, 36,49-58

P,X	WO 01 00053 A (KIMBERLY CLARK CO) 4 January 2001 (2001-01-04) page 6, last paragraph -page 10, last line; figure 1	59-79, 108-117

	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 May 2002	04 07 2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Pamies Olle, S

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Section Ch, Week 199822 Derwent Publications Ltd., London, GB; Class A96, AN 1998-244528 XP002200618 & JP 10 075978 A (KAO CORP), 24 March 1998 (1998-03-24)	118,120, 131,134, 151,155, 160,166
Y	abstract	132
Y	US 4 977 011 A (SMITH CAROL L) 11 December 1990 (1990-12-11) column 3, line 31 -column 5, line 45; claims; figures	25,28, 29,36, 38,48
Y	WO 99 47590 A (KIMBERLY CLARK CO) 23 September 1999 (1999-09-23) abstract	132
A	DE 34 23 644 A (HARTMANN PAUL AG) 2 January 1986 (1986-01-02) the whole document	1-25, 49-58
A	US 4 618 384 A (SABEE REINHARDT N) 21 October 1986 (1986-10-21) the whole document	1-25, 49-58
A	WO 98 49988 A (PARAGON TRADE BRANDS INC) 12 November 1998 (1998-11-12) the whole document	1-24, 49-79, 108-117
P,A	& US 6 123 694 A (HUFFMAN GLORIA ET AL.) 26 September 2000 (2000-09-26)	
A	WO 99 17926 A (KIMBERLY CLARK CO) 15 April 1999 (1999-04-15) page 5, line 12 -page 8, line 19 page 13, line 3 - line 14; claims; figures	118-131, 134, 143-145, 151,155, 160,166
A	WO 00 10500 A (KIMBERLY CLARK CO) 2 March 2000 (2000-03-02) page 60, line 20 - line 25 page 64, line 16 - line 25	118-131, 134, 143-145, 151,155, 160,166

International application No.
PCT/US 01/15580

INTERNATIONAL SEARCH REPORT

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-37, 49-58

   Elastic laminate material having different zones of elastic tension across a width of the material obtained by using filaments having different basis weights for the different zones of elastic tension, one processes for making the same and garments comprising this product.

2. Claims: 38-48

   Second method for producing the product of claim 1.

3. Claims: 59-117

   elastic laminate materials having different zones of elastic tension across a width of the material obtained by using filaments of diverse elastomeric polymers for the diferent zones of elastic tension, processes for making the same and garments comrising this product.

4. Claims: 118-124, 131, 143, 144, 146-161, 164-166

   Laminate comprising strand of an elastomeric material applied to a first major surface of an elastomeric film and related to the nature of the polymers used, garments incorporating this product and method for making it.

5. Claims: 125-130, 145, 162, 163, 167

   Laminate comprising strand of an elastomeric material applied to a first major surface of an elastomeric film and comprising a further facing sheet and method for making it.

6. Claims: 132, 133

   Laminate comprising strand of an elastomeric material applied to a first major surface of an elastomeric film and related to different portions of the elastomeric film exhibiting different amounts of elastic tension.

7. Claims: 134-142

   Laminate comprising strand of an elastomeric material applied to a first major surface of an elastomeric film and related to the presence of multiple elastomeric strands on the elastomeric film surface.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/15580

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